PackFlow Refresh 2023: Summary Report

A summary review of the quantity of packaging placed on the market (POM) and recycled in 2022 with compliance projections to 2028

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PackFlow 2023 Remit and Structure

Project Remit

This project seeks to analyse the quantity of packaging streams being placed on the market (POM) in the UK and being recycled in 2022, and projecting forward to 2028, in preparation for EPR.

This is achieved by:

- Updating estimates for UK packaging POM (placed on the market) by material and by industry sector in 2022 to provide a baseline for future scenarios.
- Assessing the flows of packaging recycled in 2022 and determine where the packaging is recycled in terms of end markets and whether it is recycled domestically or internationally.
- Comparing the quantity of packaging recycled with the POM quantity to identify the packaging recycling rate.
- Comparing trends with previous PackFlow reports (e.g. 2017 and 2019 published reports).
- Using the 2022 baseline POM and recycling estimates to make projections up to 2028.

Assumptions and data sources have been agreed with the Steering Group made up of key industry stakeholders representing individual materials and sectors.

Project and Reporting Structure

This overview accompanies a suite of 'PackFlow 2023' reports (available here[1]) covering each packaging material. These reports and this overview have been produced to provide industry, Governments, and other stakeholders with evidence to better understand packaging materials flows, packaging materials collection and recycling, and to assess potential compliance risks versus the packaging targets both now and in the future.

The PackFlow 2023 project is delivered as six distinct reports, one for each packaging material (material specific reports), plus this overview report. The material specific reports are broken down into two parts:

- Phase 1: Baseline 2022
    - Updates the baseline year to 2022 for estimates of packaging materials POM, collections, recycling and end markets (from 2019 in the previous flow reports).
- Phase 2: Projections to 2028
    - Develops scenarios for packaging materials flow and recycling up to 2028.
    - Assesses potential compliance risks versus recycling targets for packaging materials.

Data robustness assessments have been conducted and error margins are calculated and provided wherever possible throughout the material specific reports.

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[1] https://www.valpak.co.uk/knowledge-hub/?category=flow-reports

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PackFlow Glossary

AFH – Away-from-home

bn - Billion

C&D – Construction and demolition

C&I – Commercial & Industrial

CA – Civic amenity

Consumer Packaging – Packaging sold to consumers / packaging around products purchased by members of the public

CSP – Ceramics, Stones and Porcelain

Cullet – Crushed glass prepared for use in the glass remelt manufacturing process

DRS – Deposit Return Scheme

EfW – Energy from Waste

EPIC – Environmental Product Information Centre, Valpak's packaging database

Fibre-based composite packaging – paperboard or paper fibres that are laminated with plastic (on one or both sides); the packaging may include other material such as aluminium foil. Examples of fibre-based composite packaging are food and drink cartons, disposable drinks cups, sandwich boxes (skillets), crisps tubes, and powdered drinks tubs.

GDP – Gross Domestic Product

Glass Recycler / Reprocessor – Organisation which processes glass to prepare it for end markets such as remelt (container and fibreglass manufacturing), filtration, shotblasting, aggregates and export

Grocery Packaging – Packaging around products purchased in non-specialised retail stores with food, beverages or tobacco predominating

HDPE – high-density Polyethylene

HMRC – His Majesty's Revenue and Customs

HWRC – Household waste recycling centre

IBA – Incinerator Bottom Ash

IPA – Industrial Packaging Association

k – Thousand

kt – Thousand tonnes

LA – Local Authority (/Council)

M – Million

MRF – Materials Recovery Facility

MSW – Municipal solid waste

Non-consumer Packaging – Packaging consumed in the commercial/industrial sector (including in hotels, bars, restaurants and businesses)

Non-grocery Packaging – Packaging around products purchased in retail stores where food, beverages or tobacco is not predominating

NPWD – National Packaging Waste Database

ONS – Office for National Statistics

OTG – On-the-Go

PE – Polyethylene

PERN – Packaging Export Recovery Note

POM – Placed on the market

PP – Polypropylene

Primary Packaging – Any packaging used to contain a single ‘sales unit’ to sell to customers, e.g. aluminium cans, plastic bottles, drinks cartons. For multipacks, this includes all of the packaging on the items, including the outer bag, box etc. Primary packaging is taken home by customers, removed/opened and thrown away after consuming the contents.

PRN – Packaging Recovery Note

PRODCOM – "Production Communautaire" (Community Production)

PS – Polystyrene

PTT – Pots, Tubs and Trays

PVC – Polyvinyl Chloride

RDF – Refuse Derived Fuel

Secondary Packaging – Outer packaging used to group several ‘sales units’ to transport them or display them in store; usually cardboard boxes or shelf-ready packaging, and labels on these, not usually taken home by customers

Shipment Packaging – Packaging used for shipping single or multiple sales units directly to consumers e.g. corrugated boxes, card envelopes, moulded protective inserts, paper filler, bubble wrap and mail bags

t – Tonnes

Transit/Tertiary Packaging – Any transit packaging used to group secondary packaging units together to protect them while being transported or handled through the supply chain e.g. pallets, shrink wrap, staples or strapping, and labels on these

UBCs – Used Beverage Cans

Unregistered Consumer Packaging – Packaging arising from organisations in the consumer sector that are below or unaware of the producer responsibility threshold

VDS – Valpak Data Solutions

WDF – Waste Data Flow

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- Advisory Committee on Packaging (ACP)
- Berry
- British Glass
- Child Safe Packaging Group
- Environment Agency (EA)
- Flexographic Industries Association
- Incpen
- Industry Council for Packaging and the Environment (INCPEN)
- Natural Resources Wales
- Paper and Board Association
- Plastics Europe
- Recycling of Used Plastics Ltd (RECOUP)
- Re-Gen Waste
- Scottish Environment Protection Agency (SEPA)
- Scottish Government
- Sibelco
- Tata Steel
- The Advisory Committee on Packaging (ACP)
- The Alliance for Beverage Cartons and the Environment (ACE) UK
- The Aluminium Packaging Recycling Organisation (Alupro)
- The British Aerosol Manufacturers' Association (BAMA)
- The British Plastic Federation (BPF)
- The British Printing Industries Federation (BPIF) Cartons
- The Confederation of Paper Industries (CPI)
- The Department for the Environment, Food & Rural Affairs (Defra)
- The Department of Agriculture, Environment and Rural Affairs (DAERA) (Northern Ireland)
- The Department for Environment, Food and Rural Affairs (DEFRA)
- The Environment Agency (EA)
- The Foodservice Packaging Association (FPA)
- The Metal Packaging Manufacturers Association (MPMA)
- The Packaging Federation
- The Recycling Association
- The Scottish Government
- The Scottish Environment Protection Agency (SEPA)
- The Waste and Resources Action Programme (WRAP)
- The Welsh Government
- Timber Packaging and Pallet Confederation (TIMCON)
- UK Hospitality
- URM
- Wastepack
- Wood Panel Industries Federation (WPIF)
- Wood Recyclers Association (WRA)
- Zero Waste Scotland (ZWS)

1. Introduction

1.1. Background

The PackFlow Refresh 2023 reports (available here: https://www.valpak.co.uk/more/material-flow-reports) cover all packaging materials and have been produced to provide industry, Governments, and other stakeholders with evidence to better understand the flows of packaging in the UK in terms of material Placed on the Market (POM), collections and recycling, and to assess potential compliance risks versus the packaging targets.

1.2. Project Objectives

The PackFlow 2023 project for has the following key objectives:

- Provide an updated (and cross-checked) baseline estimate of packaging placed on the UK market in 2022, by format, sector and source:
    - Format and other such as packaging
    - Sector (e.g. consumer, non-consumer)
    - Source (handled by obligated producers who are registered, non-obligated or free riders)
- Identify household (HH) and household-like (HH-like) categories.
- Identify commonly littered items.
- Estimate the quantities packaging collected through kerbside and other collection types, and by sector.
- Estimate the quantities of packaging recovered and recycled or sent for disposal for both UK and overseas end destinations.
- Provide estimates of the quantities of packaging that is recycled (i.e. is recorded as accredited recycling) and packaging that is recycled but does not generate a PRN/PERN (i.e. is unrecorded or unaccredited).
- Provide reasonable projections base on sound and stated assumptions and industry insight into the likely level of collection and recycling of packaging material up to 2028.

1.3. Methodology

In order to calculate recycling rates, the quantity of packaging recycled is divided by the quantity of waste arisings. However, it is commonly accepted, and indeed is accepted by the EU, that establishing packaging POM is an appropriate method of estimating packaging waste arisings.

Other methodologies have been considered and discounted, such as waste composition analysis. Whilst this approach is valid, it has several significant limitations, relying on accurate and representative data for:

- The composition of household waste, undistorted by seasonality;
- Waste arisings from local authorities; and
- Waste arisings and composition from commerce and industry.

The justification of the use of POM data over alternatives is provided in full in section 1.3.1 of Plastic Flow 2025[2].

An overview of how the POM and recycling rates were calculated for this project is provided below.

1.3.1. Packaging POM

Packaging POM is estimated using a bottom-up approach, which references a variety of data sources of packaging products placed on the market combined with a gathering of data and estimates from industry. The results of this

[2] *http://www.wrap.org.uk/content/plasticflow-2025-plastic-packaging-flow-data-report*

method have been cross-checked against an assessment of the packaging POM reported on the National Packaging Waste Database (NPWD) by obligated producers and data provided by the project's industry Steering Group. The baseline year was 2022. However, where 2022 data was not available, the most recent available data was used.

1.3.1.1. POM (Bottom-up Approach)

This approach built up the POM figure using a variety of components, based on the key sectors for packaging including:

- Packaging around food, drinks, groceries and other goods, including body care, clothing, DIY products etc., as sold by supermarkets and non-grocery retailers, sourced from the Environment Agency and Valpak's Environmental Product Information Centre (EPIC) database[3];
- Packaging around food and drink as consumed in the hospitality sector, sourced from Valpak's EPIC database;
- Packaging discarded by retailers at back of store, estimated based on data provided directly by retailers; and
- Packaging used by the non-consumer sector as sourced from Defra's Commercial and Industrial Waste Arisings data publication, relating to 2018[4] and adjusting for growth/reductions.
- Other relevant data sources as appropriate as detailed in the material specific reports.

Where necessary, data was then cross checked against industry sources provided by the Steering Group.

1.3.2. Net Pack Fill

For Glass and Wood packaging, the 'net pack fill' quantity, compiled from packaging data reported by obligated companies into the NPWD, was used as the basis for total POM. For all other materials, 'net pack fill' was used as a cross-check. The estimate is thought to capture the vast majority of the relevant quantity but does omit the packaging handled by non-obligated companies, free-riders (those companies who are above the packaging obligation threshold by having an annual turnover of £2 million and handling 50 tonnes of packaging or more per year but are not registered with the relevant agency) and packaging for internal company use, which is non-obligated packaging under the regulations.

To estimate the amount of packaging placed on the UK market by obligated companies, the calculation set out below was applied. This calculation uses the total data reported by obligated packaging producers and is available on the NPWD website[5]:

Net Pack Fill	=	**Packing/Filling** Table 1 (pack/filling)	+	**Imports** Table 3A (imported for selling)	+	**Imports** Table 3B (packaging removed from around imports)	−	**Exports** Table 2A + Table 2B (pack/filling)

This report uses NPWD data estimates for 2023 submissions to reflect obligated packaging POM in 2022. At the time of publication of this report, full year submissions of 2022 packaging were not available, so estimates are obtained by using NPWD data for data year 2021 and applying an estimate of the percentage change in obligated packaging by material between 2022 and 2021. The estimate of the percentage change is informed by changes in packaging flow for each material between the data years 2021 and 2022 arising from approximately 1,600 Valpak members who had registered in 2022 and 2023 under the same registrations and were still registered with the same agencies as of July 2023.

[3] *The database is based on information collected direct from suppliers as well as information sourced by Valpak, meaning that it holds a wide coverage of information across multiple product ranges. Product-specific data collection is completed through site visits, supplier mailings and weighing in-house (purchasing product and collecting used product from staff). All data goes through a comprehensive checking process on receipt and is stored in Valpak's bespoke software Environmental Product Information Centre (EPIC).*
[4] *https://www.gov.uk/government/statistics/uk-waste-data published October 2018*
[5] *www.npwd.environment-agency.gov.uk*

On a regular basis throughout the PackFlow process, Valpak also downloaded the live 2023 submission position from NPWD (for the 2022 data year) and analysed the change in number of registrations and aggregated data to cross reference against forecast position and identify any large divergence from the expected outcomes.

1.3.3. Recycling

NPWD was used as the source for accredited (recorded) recycling of packaging. Industry, including reprocessors and exporters, were consulted on the recycling of packaging that might not, for whatever reason, be reported on NPWD. The output of these discussions was used to estimate a figure for non-accredited (unrecorded) recycling.

The total recycling figure, consisting of recorded and unrecorded recycling, was then split into consumer and non-consumer recycling. WasteDataFlow (WDF) was used as the source for the consumer recycling data, with the difference between the WDF total and the overall total assumed to be non-consumer recycling. WDF was considered by the Steering Group to be the best available source of consumer recycling data, as it is the most comprehensive and is believed by the Steering Groups to not suffer from the significant losses with the exception of plastic, where such losses were estimated by industry experts in consultation with industry itself.

1.3.4. Projections

The baseline data year for packaging POM is calendar year 2022. The projected tonnages from 2022 to 2040 are developed with the following considerations (note that the report tables show a summary of the scenarios to 2028):

1. Near term. Profile shaped based on market intelligence and datasets that are available for year to date in 2023. Typically, in the near term there's more information available on which to base projections and make assumptions. For example, qualitative commentaries on current market conditions are used. The current cost of living crisis is a key source of uncertainty distorting purchasing decisions and, to the extent that this is reflected in indicator data, it is built into the profile of the projections.
2. Medium term. The scenario projections link to growth projections to inform the scenario profiles 2024 to 2040. Official published economic projections to 2028 are used, namely the Office for Budget Responsibility (OBR)'s forecast published in November 2023 to accompany the Chancellor's Autmn 2023 Statement.
3. Long term. As the projection horizon extends further out there's inevitably greater uncertainty. The scenario projections adopt a 'return to trend or steady state' growth approach.

The POM projections are linked to indicators (and projections of these indicators). The indicators considered are selected through analysis of historical relationships with packaging POM. Therefore, they are (statistically) *a priori* deemed potentially useful in describing the evolution of packaging POM. The indicators used are grouped according to level/growth in; economic activity (GDP, GVA by sector, construction, imports), spending (consumer spending and retail sales), and population. Data for all indicators is sourced from the ONS and is adjusted by the ONS to remove the effects of changes in prices, so they are indicators of activity potentially related to the tonnage of packaging POM in real-terms.

1.3.5. Scenarios

Three EPR scenarios for each of the packaging materials covered in the Packflow Refresh 2023 were developed for the POM projections. The three scenarios are:

- EPR scenario 1: All packaging materials subject to recycling obligations under 2007 Regulations for 2024 and under new EPR regulations from 2025 onwards (all packaging is in scope of current producer responsibility obligations from 2022 to 2025);
- EPR scenario 2: DRS drinks containers excluding glass removed from recycling obligations under EPR in 2027 onwards; and
- EPR scenario 3: DRS drinks containers *including* glass containers for Scotland and Wales, and *excluding* glass drinks containers in England and Northern Ireland, are removed from EPR POM tonnages from 2027.

In the context of scenarios 2 and 3 'removing DRS drinks containers', (glass as above) from EPR' means removing these materials from EPR recycling obligations. The policy is that they are not subject to disposal cost fees in the period between the new EPR regulations coming into force (from 2025) and DRS 'going live' (from 2027). Note that glass packaging is the only material impacted in scenario 3.

The scenarios provide an assessment of likely recycling performance, in each year, to 2028 (note the projections extend to 2040 but data to 2028 is shown as a summary). In each scenario packaging materials are assumed to be under EPR from 2025 and the tables below show (to 2028) the tonnages of packaging placed on the market which would be under EPR. Also shown are the business targets (%, k tonnes), obligated packaging tonnages, the level (%) of non-obligated packaging, accredited packaging recycling (k tonnes), the projected surplus/shortfall of recycling relative to the business target, and a summary of the recycling rate performance over the scenario horizon.

The scenarios calculate the tonnage of accredited recycling based on the amount of packaging POM and an assumed collection rate. The scenarios assume the collection of EPR packaging material is separated from the DRS collection system and no other loss i.e., 100k tonnes of EPR packaging POM equates to 100k tonnes of EPR packaging available to be collected for accredited recycling. In reality there will be loss to residual streams and in handling/sorting, and DRS materials not captured by a DRS could end up in the recycling waste stream collected for accredited recycling.

Please note that due to ongoing policy development at the time if writing, EPR scenarios 1, 2 and 3 may not align with final policy positions.

1.3.6. Data Robustness

As there are levels of uncertainty around the data used to establish the various elements that are combined to make the total POM, consumer, non-consumer and total packaging POM are presented with indicative error margins, providing a range around the estimate. The robustness scores established for each data piece used are presented in Appendices to the material reports and these have been converted into a percentage and related to appropriate margins of error[6], as shown below in Table 1. The indicative margins of error are provided throughout the report.

Table 1: Relating Robustness Scores to Indicative Error Margins

Robustness Score			Indicative Error Margin	
96%	to	100%	+/-	3%
91%	to	95%	+/-	6%
86%	to	90%	+/-	9%
81%	to	85%	+/-	12%
76%	to	80%	+/-	15%
71%	to	75%	+/-	18%
66%	to	70%	+/-	21%

The method used to calculate the margin of error for the total POM used the margins of error for the elements that made up the total POM to convert this to a tonnage, and then using the Root of Sum of Squares (since we are dealing with the error of a sum) it was expressed as a percentage.

1.4. Recommendations for Further Work

In each to the material specific reports, a series of recommendations for further work have been outlined.

[6] *These are assumed estimates of error margin and not the outputs of statistical calculation*

2. Paper and Card

2.1. Paper and Card Packaging POM

This report estimates paper and card packaging POM in 2022 to be 4,843kt (+/- 7%)[7,8], a decrease of 3% from the previous estimate in 2019.

The paper and card packaging POM estimate is derived using a bottom-up methodology, taking data from various sources for each sector and combining the results. It is cross-checked with reported obligated data on NPWD (National Packaging Waste Database) and with data provided by the project's industry Steering Group.

Figure 1 provides an overview of the paper and card packaging POM by sector in 2022. The total POM is the sum of the consumer[9] and non-consumer[10] packaging.

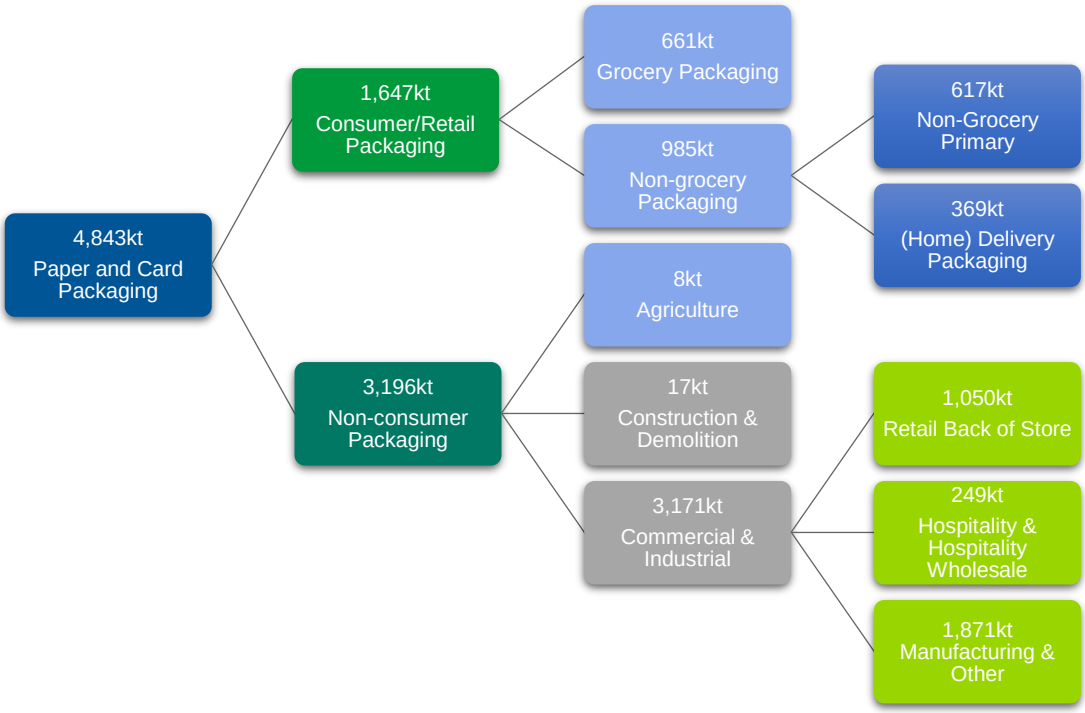
The estimate for paper and card packaging POM in the consumer sector is 1,647kt (+/- 8%).

The methodology for consumer POM is based on primary sales data from a sample of UK supermarkets selling both grocery and non-grocery items, alongside reliable market share data. This method is considered the most robust there is available and is accepted by industry. Home delivery packaging was also estimated and added to the consumer packaging total.

The estimate for paper and card packaging POM in the non-consumer sector is 3,196kt (+/- 10%).

Retailer back of store data was estimated based on data provided directly by retailers. Hospitality data was scaled up from Valpak EPIC data[11] for the sector. The remaining data was derived by applying packaging protocols to the Defra C&I (Commercial & Industrial) Waste Statistics and adjusting for growth/reductions. It was broken down and verified using Valpak EPIC data where appropriate.

Figure 1: Paper and Card Packaging POM by Sector, 2022 (kt)



[7] *The error margins are assumed estimates based on the robustness assessment and are not the outputs of statistical calculation.*
[8] *This error margin indicates that the two paper and card packaging POM figures are not substantially different.*
[9] *Consumer packaging is packaging around products for personal, family, household or social use (i.e. not for commercial/ industrial use).*
[10] *Non-consumer packaging is packaging used in the commercial, industrial, agricultural, or construction and demolition sectors.*
[11] *Valpak's EPIC database holds sales data and packaging weights information for clients signed up for the fully managed service. It holds data for 34 million products and related packaging.*

Non-obligated or unregistered flow for paper and card packaging accounted for 14% of POM in 2022 – this represents a decrease from 2019, when it was 19%[12].

Using data from NPWD, an estimate of the unobligated tonnage (664kt, 14%) has been made by subtracting the net pack fill[13] figure of 4,179kt from the project's final flow estimate of 4,843kt. The unobligated proportion of 14% is a decrease from the 19% in 2019[12] but is more similar to the 16% calculated in the 2017 Paper Flow report.

The final project estimate of paper and card packaging POM by type is 3,175kt (66%) corrugated, 887kt (18%) cartonboard and other packaging boards, 144kt (3%) fibre-based composites and 638kt (13%) other packaging.

The format types for paper and card packaging are established primarily using information from Valpak's EPIC database. This was compared with data provided by industry experts. Stakeholder feedback anticipated a split of 64% corrugated, 27% cartonboard and other packaging boards, 2% liquid packaging board (not including other fibre-based composites) and 6% other packaging (such as packaging paper and moulded fibres). This implies that some of the packaging identified as 'other' will likely be cartonboard.

2.2. Paper and Card Recycling

The total quantity of paper and card packaging recycled in 2022 is estimated to be 3,934kt.

This includes reported (NPWD) recycling of 3,695kt and an estimate for unreported recycling (239kt). Based on the POM calculated as part of this project, this gives an overall recycling rate of 82%, up 3% since 2019. Of this, 3,695kt was reported on NPWD, representing a recycling rate of 77% (unchanged from 2019).

The total quantity of consumer paper and card packaging recycled[14] in 2022 is estimated to be 1,313kt.

This is based on WasteDataFlow (WDF), the database for local authority collected waste. Based on the POM calculated as part of this project, this gives a consumer recycling rate of 80%, up 12% since 2019.

The total quantity of non-consumer paper and card packaging recycled[15] in 2022 is estimated to be 2,622kt.

This is calculated by subtracting the consumer recycling tonnage from the total tonnage recycled figure. Based on the POM calculated as part of this project, this gives a non-consumer recycling rate of 83%.

2.3. Paper and Card End Markets

In 2022 32% of paper and card packaging collected was recycled in the UK

Based on NPWD figures for 2022, 32% of the recorded paper and card packaging recycling took place in the UK and 68% overseas.

Non-OECD-member countries in Asia were the key export markets for paper and card packaging exported from the UK

Non-OECD-member countries in Asia were the key export destinations in 2022, with Vietnam (17% of exports), India (17%), Malaysia (14%), Indonesia (12%) and Thailand (9%) taking most of the material within that category. Turkey took 13% of exports, Germany 10%, the Netherlands 4% and France 3%.

[12] Note that the Covid-19 PackFlow report gave a figure of 3,914kt for net pack fill for 2019 tonnage (2020 obligation year), based on NPWD reported tonnages in October 2020, giving a 22% non-obligated/ unregistered percentage. Late registrants added 149kt, increasing the final net pack fill for 2019 POM to 4,063kt, giving a 19% non-obligated/ unregistered percentage.

[13] The net pack fill figure is used to estimate the amount of packaging placed on the UK market by obligated companies. It is obtained from the total data reported by obligated packaging producers that is available on the NPWD website. The calculation is as follows:

Net Pack Fill = Packing/Filling Table 1 (pack/filling)
+ Imports Table 3A (imported for selling) + Imports Table 3B (packaging removed from around imports)
– (Exports Table 2A + Table 2B (pack/filling))

[14] Consumer packaging recycling is equated to packaging recycled by households.

[15] Non-consumer packaging recycling is equated to packaging recycled in the commercial, industrial, agricultural, or construction and demolition sectors.

2.4. Scheme Administrator Submissions

The total tonnage of packaging POM that is like to be declared by obligated business to the scheme administrator as meeting the criteria of being for public/consumer use (formally referred to as 'household / household like') is 1,732kt, of which 123kt is 'fibre composite'.

Table 2: Total Expected Scheme Administrator Submissions (kt)

Material / Situation	Total POM	Total Consumer	Total Non-Consumer	Total Hospitality	Total Hospitality - Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Paper and card (all) – All	**4,843**	1,647	3,196	249	85	**1,732**
Paper and card (all) - excluding DRS	**4,843**	1,647	3,196	249	85	**1,732**
Paper and card (excl fibre composite) – All	**4,699**	1,574	3,125	180	35	**1,609**
Paper and card (excl fibre composite) - excluding DRS	**4,699**	1,574	3,125	180	35	**1,609**
Fibre Composite – All	**144**	73	71	69	50	**123**
Fibre Composite - excluding DRS	**144**	73	71	69	50	**123**

2.5. Consumer Packaging in the Household Waste Stream

The total proportion of consumer paper and card packaging from grocery retailers that is disposed of in the household waste stream is 77%. The total proportion of consumer paper and card packaging from non-grocery retailers that is disposed of in the household waste stream is 92%. This is based on the same sample of retailers as is used in the rest of this report and equates to 1,426kt (87%) of packaging in total across both grocery and non-grocery retail packaging.

2.6. Consumer Packaging in the 'Litterable' Categories

The total proportion of consumer paper and card packaging from grocery retailers within the 'litterable' categories (as described in the material specific reports) is 21%. The total proportion of consumer paper and card packaging from non-grocery retailers within the 'litterable' categories is 0%. This is based on the same sample of retailers as is used in the rest of this report and equates to 139kt (8%) of packaging in total.

2.7. Packaging Future Trends and Scenarios

Paper and card POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes from 2024 it is projected to remain below its 2022 level until 2027. Business targets are projected as constant at 2024 level of 83%. The POM projection is reflected in the projection of obligated tonnage for paper and card packaging, and (with assumed constant collection rates) the projection of accredited recycling. Paper and card packaging is not an in-scope DRS material, and its projection is not impacted by the removal of DRS drinks containers from recycling obligations under EPR. Based on this paper and card packaging is projected to be in a surplus relative to the business target from 2023 to 2028.

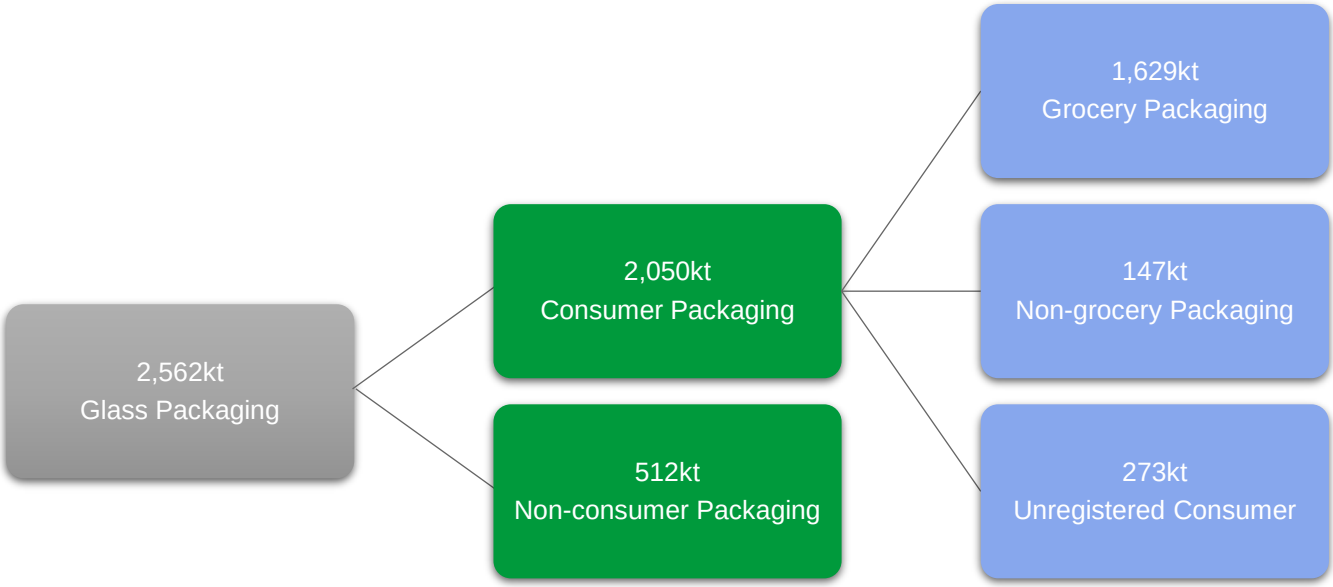
3. Glass

3.1. Glass Packaging POM

This report estimates glass packaging POM in 2022 to be 2,562kt (+/- 6%)[16], a decrease of 0.5% from the previous estimate in 2019.

The glass packaging POM estimate is established using a methodology that identifies UK production of glass packaging, adds imports of glass packaging, and removes exports of glass packaging. Data from a variety of sources is used for each sector and the results combined. The POM figure is cross-checked with reported obligated data on NPWD and with this project's industry Steering Group.

Figure 2: Glass Packaging POM by Sector, 2022 (kt)



The estimate for glass packaging POM in the consumer sector is 2,050kt (+/- 5%).

The methodology for consumer POM is based on primary sales data from a sample of UK supermarkets alongside reliable market share data. No other method is used for deriving consumer data as this method is considered the most robust available and is accepted as such by industry.

The estimate for glass packaging POM in the non-consumer sector is 512kt (+/- 15%).

Non-consumer glass packaging POM is derived by subtracting the consumer POM estimate from the total POM estimate for glass packaging. The estimates are reviewed and sense-checked by key industry stakeholders.

The non-obligated or unregistered flow estimate for glass packaging POM accounts for 11% of total POM in 2022 – this represents an increase of 2% from 2019.

The estimate of the unobligated/unreported tonnage (273kt, 11%) in 2022 uses NPWD data to calculate a final net pack fill figure of 2,288kt, which is then subtracted from the total glass packaging POM estimate of 2,562kt. The unobligated proportion of 11% is an increase from the 9% identified in 2019.

The estimates of glass packaging POM by format type are: 2,116kt (83%) glass bottles and 446kt (17%) glass jars.

[16] *The error margin indicates that the two glass packaging POM figures are not substantially different.*

The format types for glass packaging are established primarily using information from Valpak's EPIC database and sense-checked by key industry stakeholders including British Glass. Across glass packaging formats on the market, glass bottles make up the vast majority (by weight) of glass packaging.

3.2. Glass Packaging Recycling

The total quantity of UK glass packaging recycled is estimated to be 1,898kt in 2022.

This includes NPWD reported glass packaging recycling (1,872kt) and an estimate of unreported glass packaging recycling (26kt). Based on the POM calculated as part of this project, this gives an overall glass packaging recycling rate of 74.1% in 2022, and an accredited recycling rate for glass packaging of 73.1%.

The total quantity of consumer[17] UK glass packaging recycled is estimated to be 1,460kt.

Based on WDF collection figures and the consumer POM calculated in this project, the consumer glass packaging recycling rate is estimated to be 71%.

The total quantity of non-consumer[18] UK glass packaging recycled is estimated to be 438kt.

Non-consumer glass packaging recycling is calculated by removing the consumer recycling tonnage from the figure for total glass packaging recycling. Based on the non-consumer POM estimate in this project, the non-consumer glass packaging recycling rate is 86% in 2022.

Of the total 664kt of glass packaging not recycled, 531kt (80%) is sent for energy recovery and 133kt to landfill (20%) in 2022.

This is based on an estimated total of 590kt of consumer glass packaging not being recycled and 74kt of non-consumer not being recycled, estimated using WDF and published statistics on UK disposal routes for glass packaging.

3.3. End Markets

In 2022, 82% of glass collected was recycled in the UK.

In 2022, 82% of the recorded glass packaging recycling took place in the UK with the remaining 18% occurring overseas.

Glass is primarily recycled in remelt end markets in the UK.

Overall, 74% of the recorded glass packaging collected in the UK is recycled in remelt applications (UK and overseas). Of the glass packaging recycled in the UK, 68% went into remelt applications and 32% into 'other' applications.

Of the remelt fraction, industry suggests 15-20% is used to produce glass mineral wool and the remainder is used by the container industry. For non-remelt applications, typically glass is used as an aggregate substitute, which includes glass used in road construction, concrete products, as a shot blasting abrasive or filtration media.

The EU is the main export market for glass packaging exported from the UK.
Nearly all glass packaging exports in 2022 were destined for remelt applications with the container sector believed to take the majority. The key export destinations were Portugal (48%), Belgium (30%), Netherlands (9%), Spain (6%), Italy (5%), and Norway (1%).

3.4. Scheme Administrator Submissions

The total tonnage of packaging POM that is like to be declared by obligated business to the scheme administrator as meeting the criteria of being for public/consumer use (formally referred to as 'household / household like') is 2,562kt, of which 2,302kt would remain in the EPR system following the introduction of DRS in Scotland and Wales.

[17] *Consumer packaging is packaging consumed in the household.*
[18] *Non-consumer packaging is packaging consumed in the commercial/industrial sector.*

Table 3: Total Expected Scheme Administrator Submissions (kt)

Material / Situation	Total POM	Total Consumer	Total Non-Consumer	Total Hospitality	Total Hospitality - Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Glass - All	**2,562**	2,050	512	512	512	**2,562**
Glass - excluding DRS all nations	**536**	506	30	30	30	**536**
Glass - excluding DRS Scotland and Wales Only	**2,302**	1,852	450	450	450	**2,302**

3.5. Consumer Packaging in the Household Waste Stream

The total proportion of consumer glass packaging from grocery retailers that is disposed of in the household waste stream is 76%. The total proportion of consumer glass packaging from non-grocery retailers that is disposed of in the household waste stream is 77%. The remainder of glass is typically disposed in the work, gym, transport, educational and recreational facilities etc. This is based on the same sample of retailers as is used in the rest of this report and equates to 1,558kt (76%) of packaging in total across both grocery and non-grocery retail (consumer packaging).

3.6. Consumer Packaging in the 'Litterable' Categories

The total proportion of consumer glass packaging from grocery retailers that falls within the 'litterable' categories (as described in the material specific reports) is 74%. The total proportion of consumer glass packaging from non-grocery retailers that falls within the 'litterable' categories is 76%. This is based on the same sample of retailers as is used in the rest of this report and equates to 1,317kt (74%) of packaging in total.

3.7. Packaging Future Trends and Scenarios

Two EPR scenarios relevant for glass are (with further analysis available in the material specific report):

- EPR scenario 1: All packaging materials subject to recycling obligations under 2007 Regulations for 2024 and under new EPR regulations from 2025 onwards (all packaging is in scope of current producer responsibility obligations from 2022 to 2025);
- EPR scenario 3: DRS drinks containers *including* glass containers for Scotland and Wales, and *excluding* glass drinks containers in England and Northern Ireland, are removed from EPR POM tonnages from 2027.

3.7.1. EPR Scenario 1

Glass POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes from 2024 it remains below its 2022 level until 2028. Business targets are projected as constant at 2024 level of 82%. The POM projection is reflected in the projection of obligated tonnage for glass packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this a surplus relative to the business target 2024 to 2028 is projected for glass packaging.

3.7.2. EPR Scenario 3

Glass POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes from 2024 it remains below its 2022 level until 2026. Glass drinks containers in Scotland and Wales are removed from EPR POM from 2027 onwards (~260k tonnes). The business targets for the remaining material are projected as constant at 2024 level of 82%. The POM projection is reflected in the projection of obligated tonnage for glass packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this a slight shortfall relative to the

business target 2024 to 2026 is projected for glass packaging. The reduction in the recycling obligation relative to the projection for accredited recycling results in a surplus relative to the business target from 2027 onwards, which indicates that either the business target and/or the modelled collection rate could be adjusted downwards whilst still achieving the target.

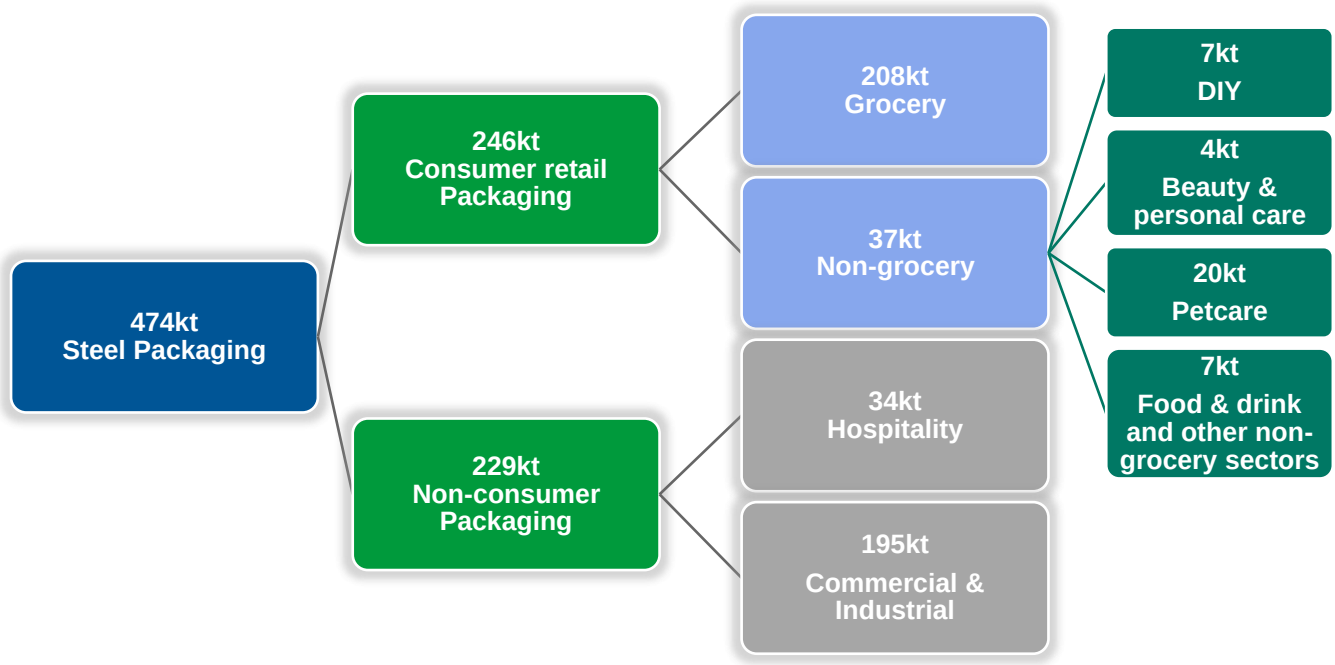
4. Steel

4.1. Steel Packaging POM

This report estimates steel packaging POM in 2022 to be 474kt (+/- 6%).

This estimate is derived from reported obligated data (EA, NPWD) and cross-checked as far as is possible using a bottom-up methodology combining data from various sources for each sector and data provided by the project's industry Steering Group.

Figure 3: Steel Packaging POM by Sector, 2022 (kt)



The estimate for steel packaging POM in the Consumer sector is 246kt (+/-5%) in 2022.

This estimate is based on primary data alongside reliable market share data. No other method is used for deriving Consumer data as this method is considered the most robust available and is accepted by the industry Steering Group supporting this steel flow project.

The estimate for steel packaging POM in the Non-Consumer sector is 229kt (+/-11%) in 2022.

This estimate comprises an estimate of Hospitality packaging based on primary and market share data, to which separate quantities of direct sales of soft and alcoholic drinks using steel packaging (calculated based on industry figures) are added. C&I steel packaging is estimated as the remaining part of Non-Consumer POM and is the residual tonnage once Consumer and Hospitality POM are deducted from total steel packaging POM. This figure is cross-checked using a bottom-up approach based on estimates of industrial packaging types using secondary research and industry/Steering Group knowledge. The cross-check figure is within 8% of the residual tonnage estimate (despite some steel packaging that could not be quantified).

4.2. Steel Packaging Recycling

Steel packaging recycling (recorded & unrecorded) is estimated to be 506kt in 2022.

This includes accredited (or recorded) recycling of 366kt (NPWD) and an estimate for unrecorded recycling of 140kt. Based on this project's POM an overall steel packaging recycling rate of 100% is estimated, reasons for this are explored further in the material specific report. The total recycling rate for steel packaging is dependent on applying

protocols for the quantity of packaging within the recycling streams for ferrous steels. The accredited (or recorded) recycling rate for steel packaging is 77% in 2022.

Consumer steel packaging recycled is estimated to be 285kt in 2022.

Based on this project's POM estimate a Consumer recycling rate of over 100% is estimated (the figure is 116% and reasons for this are explored further in the material specific report). Inclusion of Non-Consumer steel packaging recycling recorded on Waste Data Flow (WDF) or included within MSW supplied to EfW plants is likely to be a factor in the overstatement of Consumer steel packaging recycling.

Non-Consumer steel packaging recycled is estimated to be 221kt in 2022.

This is estimated by subtracting Consumer steel packaging recycling from total steel packaging recycling. Based on this project's POM the Non-Consumer steel packaging recycling rate is 97% in 2022.

It is assumed that all steel packaging is ultimately recovered from incinerator bottom ash (IBA), either in the UK, or overseas via exports of refuse derived fuel (RDF). Up to 8kt of steel packaging not recycled may be landfilled.

Whilst this does not tally with the 100% steel packaging recycling rate, it falls within the error margins calculated for steel packaging POM and recycling. It is clear that the amount of steel within RDF, and the amount of steel packaging within ferrous steel grades, both being sent for recycling and for RDF, is an extremely sensitive metric for defining steel packaging recycling.

4.3. Steel Packaging End Markets

Recycled steel packaging is used in a wide range of different products once recycled, including in construction, automotive and packaging applications. Based on NPWD figures for 2022, 47% of the recorded steel packaging recycling took place in the UK and 53% overseas. Non-OECD member countries in Asia were the key export destinations, including India, Pakistan and Bangladesh. Turkey received the second highest tonnage in 2022.

4.4. Scheme Administrator Submissions

The total tonnage of packaging POM that is like to be declared by obligated business to the scheme administrator as meeting the criteria of being for public/consumer use (formally referred to as 'household / household like') is 248kt, of which 4kt would be included in a DRS.

Table 4: Total Expected Scheme Administrator Submissions (kt)

Material / Situation	Total POM	Total Consumer	Total Non-Consumer	Total Hospitality	Total Hospitality - Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Steel - All	**474**	246	229	34	2	**248**
Steel - excluding DRS	**470**	244	227	32	0	**244**

4.5. Consumer Packaging in the Household Waste Stream

The total proportion of consumer steel packaging from Grocery retailers that is disposed of in the household waste stream is 81.5%. The total proportion of consumer steel packaging from Non-Grocery retailers that is disposed of in the household waste stream is 95.3%. This is based on the same sample of retailers as is used in the rest of this report and equates to 98.8kt (83.5%) of packaging in total across both Grocery and Non-Grocery retail (consumer packaging).

4.6. Consumer Packaging in the 'Litterable' Categories

The total proportion of consumer steel packaging from Grocery retailers that falls within the 'litterable' categories (as described in the material specific reports) is 2.3%. The total proportion of consumer steel packaging from Non-Grocery retailers that falls within the 'litterable' categories is 1.7%. This is based on the same sample of retailers as is used in the rest of this report, and equates to 2.62kt of packaging in total.

4.7. Packaging Future Trends and Scenarios

Two EPR scenarios relevant to steel are (with further analysis available in the material specific report);

- EPR scenario 1: All packaging materials subject to recycling obligations under 2007 Regulations for 2024 and under new EPR regulations from 2025 onwards (all packaging is in scope of current producer responsibility obligations from 2022 to 2025);
- EPR scenario 2: DRS drinks containers excluding glass removed from recycling obligations under EPR in 2027 onwards

4.7.1. EPR Scenario 1

Steel POM tonnage is projected to reduce in 2023 compared to 2022, with continuous year-on-year declines to 2028. Business targets are projected as constant at 2024 level of 87%. The POM projection is reflected in the projection of obligated tonnage for steel packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, steel packaging is projected to have a small shortfall relative to the business target 2024 to 2028.

4.7.2. EPR Scenario 2

Steel POM tonnage is projected to reduce in 2023 compared to 2022, with continuous year-on-year declines to 2026. Steel drinks containers are removed from EPR from 2027 onwards (~2k tonnes). The business targets for the remaining material are projected as constant at 2024 level of 87%. The POM projection is reflected in the projection of obligated tonnage for steel packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, a surplus relative to the business target 2024 to 2028 is projected for steel packaging. However, the surplus indicates that either the business target and/or the modelled collection rates could be adjusted downwards whilst still achieving the target.

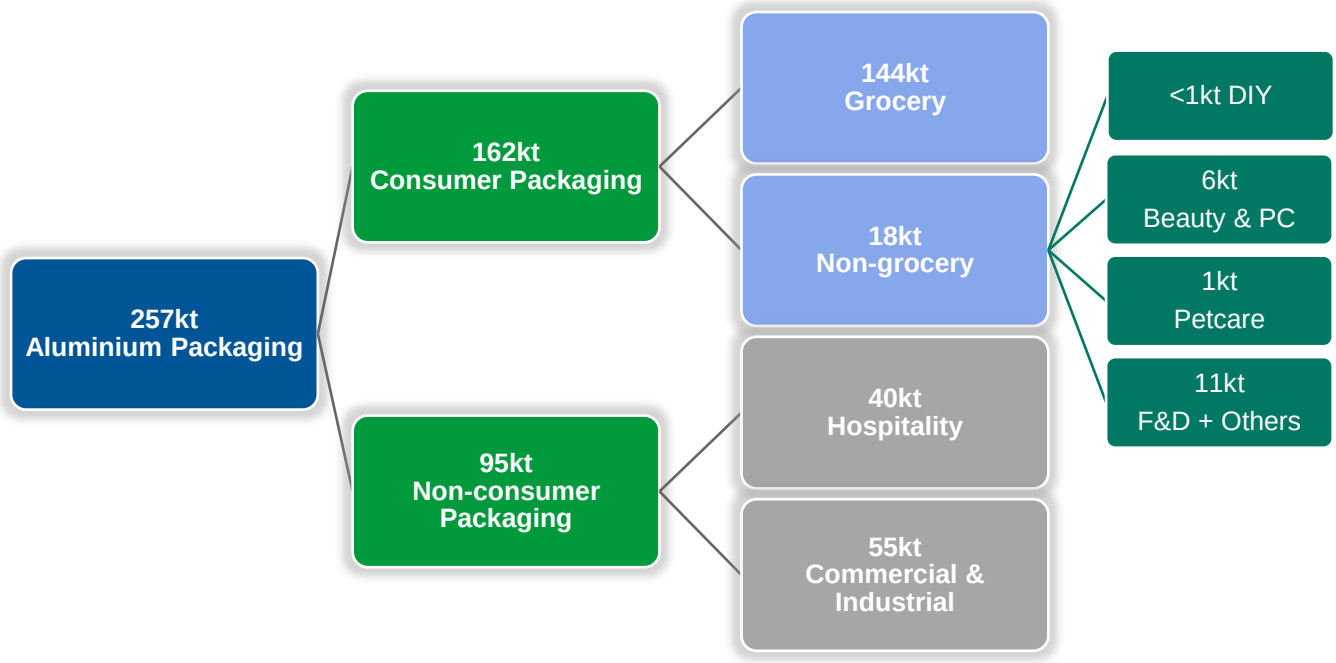
5. Aluminium

5.1. Aluminium Packaging POM

This report estimates aluminium packaging POM in 2022 to be 257kt (+/- 5%)[19].

This estimate is derived by calculating obligated aluminium packaging POM from data reported in the National Packaging Waste Database (NPWD) by obligated producers using the net pack fill method. Estimates of 1% non-obligated packaging for aluminium are added to the obligated packaging POM to generate the total aluminium POM estimate. The results of this method are cross-checked against secondary research and data/information provided by the project's industry Stakeholder Group.

Figure 4: Aluminium Packaging POM by Sector, 2019 (kt)



The estimate for aluminium packaging POM in the consumer sector is 162kt in 2022.

This estimate is based on primary data alongside reliable market share data. No other method is used for deriving consumer data as this method is considered the most robust available and is accepted by the industry Stakeholder Group supporting the aluminium project.

The estimate for aluminium packaging POM in the non-consumer sector is 95kt in 2022.

This estimate comprises an estimate of aluminium packaging in the hospitality sector based on primary and market share data and separate estimates of the amounts of direct sales of soft and alcoholic drinks based on industry sales figures. C&I aluminium packaging comprises the remaining part of non-consumer POM and is the residual tonnage once consumer and hospitality POM are deducted from total POM. There are no figures available to cross-check this data which may therefore include any missed tonnages of consumer grocery, consumer non-grocery and/or hospitality POM.

[19] *The error margins are assumed estimates based on the robustness assessment and are not the outputs of statistical calculation.*

5.2. Aluminium Packaging Recycling

Aluminium packaging recycling (recorded & unrecorded) is estimated to be 157kt in 2022.

This includes accredited (or recorded) recycling of 144kt (NPWD) and an estimate for unrecorded recycling of 13kt. Based on the POM estimate in this project, the overall aluminium recycling rate is 61% in 2022. The accredited (or recorded) aluminium packaging recycling rate is 56% in 2022.

Consumer aluminium packaging recycling (recorded & unrecorded) is estimated to be 141kt in 2022.

Based on this project's POM estimate the consumer aluminium packaging recycling rate is 87% in 2022.

Non-consumer aluminium packaging recycling (recorded & unrecorded) is estimated to be 16kt in 2022.

This is calculated by subtracting the consumer recycling tonnage from total aluminium packaging recycled. Based on this project's POM the non-consumer aluminium packaging recycling rate is 17% in 2022.

It is estimated that 98kt of aluminium packaging is not recycled, of which 12kt (13%) is estimated to be lost during energy recovery and 85kt (87%) goes to landfill.

This is based on an estimated total of 21kt of consumer aluminium packaging and 77kt of non-consumer aluminium packaging not being recycled.

5.3. Aluminium End Markets

In 2022 36% of aluminium packaging collected was recycled in the UK.

Based on NPWD figures for 2022, 36% of recorded aluminium packaging recycling took place in the UK and 64% overseas.

EU27+2 countries were the key markets for aluminium packaging exported from the UK

EU27+2 countries were the key export destinations in 2022 (78% of exports), the largest markets being Germany (35%), Netherlands (15%) and Greece (9%). 16% of UK exports went to non-OECD Asian countries, notably Thailand (8% of exports). OCED countries received 6% of exported UK aluminium, the largest market being Korea (4% of exports).

5.4. Scheme Administrator Submissions

The total tonnage of packaging POM that is like to be declared by obligated business to the scheme administrator as meeting the criteria of being for public/consumer use (formally referred to as 'household / household like') is 175kt, of which would fall to 39kt when material included in a DRS is removed.

Table 5: Total Expected Scheme Administrator Submissions (kt)

	Total POM	Total Consumer	Total Non-Consumer	Total Hospitality	Total Hospitality - Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Aluminium - All	257	162	95	40	13	175
Aluminium - excluding DRS	62	39	23	0	0	39

5.5. Consumer Packaging in the Household Waste Stream

The total proportion of consumer aluminium packaging from Grocery retailers that is disposed of in the household waste stream is 67%. The total proportion of consumer aluminium packaging from Non-Grocery retailers that is disposed of in the household waste stream is 70%. This is based on the same sample of retailers as us used in the rest of this report and equates to 109kt (67%) of packaging in total across both Grocery and Non-Grocery retail (consumer packaging).

5.6. Consumer Packaging in the 'Litterable' Categories

The total proportion of consumer aluminium packaging from Grocery retailers within the 'litterable' categories (as described in the material specific reports) is 85%. The total proportion of consumer aluminium packaging from non-Grocery retailers within the 'litterable' categories is 77%. This is based on the same sample of retailers as is used in the rest of this report and equates to 136kt of packaging in total.

5.7. Packaging Future Trends and Scenarios

Two EPR scenarios relevant to aluminium are (with further analysis available in the material specific report);

- EPR scenario 1: All packaging materials subject to recycling obligations under 2007 Regulations for 2024 and under new EPR regulations from 2025 onwards (all packaging is in scope of current producer responsibility obligations from 2022 to 2025);
- EPR scenario 2: DRS drinks containers *excluding* glass removed from recycling obligations under EPR in 2027 onwards

5.7.1. EPR Scenario 1

Aluminium POM tonnage is projected to reduce in 2023 compared to 2022, with continuous year-on-year declines to 2028. Business targets are projected as constant at 2024 level of 69%. The POM projection is reflected in the projection of obligated tonnage for aluminium packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, aluminium packaging is projected to be higher relative to the business target 2024 to 2028.

5.7.2. EPR Scenario 2

Aluminium POM tonnage is projected to decrease in 2023 compared to 2022, with continuous year-on-year declines to 2026. The business targets for the remaining material are projected as constant at 2024 level of 87%. The POM projection is reflected in the projection of obligated tonnage for aluminium packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, a surplus relative to the business target 2024 to 2028 is projected for aluminium packaging. However, the surplus indicates that either the business target and/or the modelled collection rates could be adjusted downwards whilst still achieving the target.

6. Plastic

6.1. Plastic Packaging POM

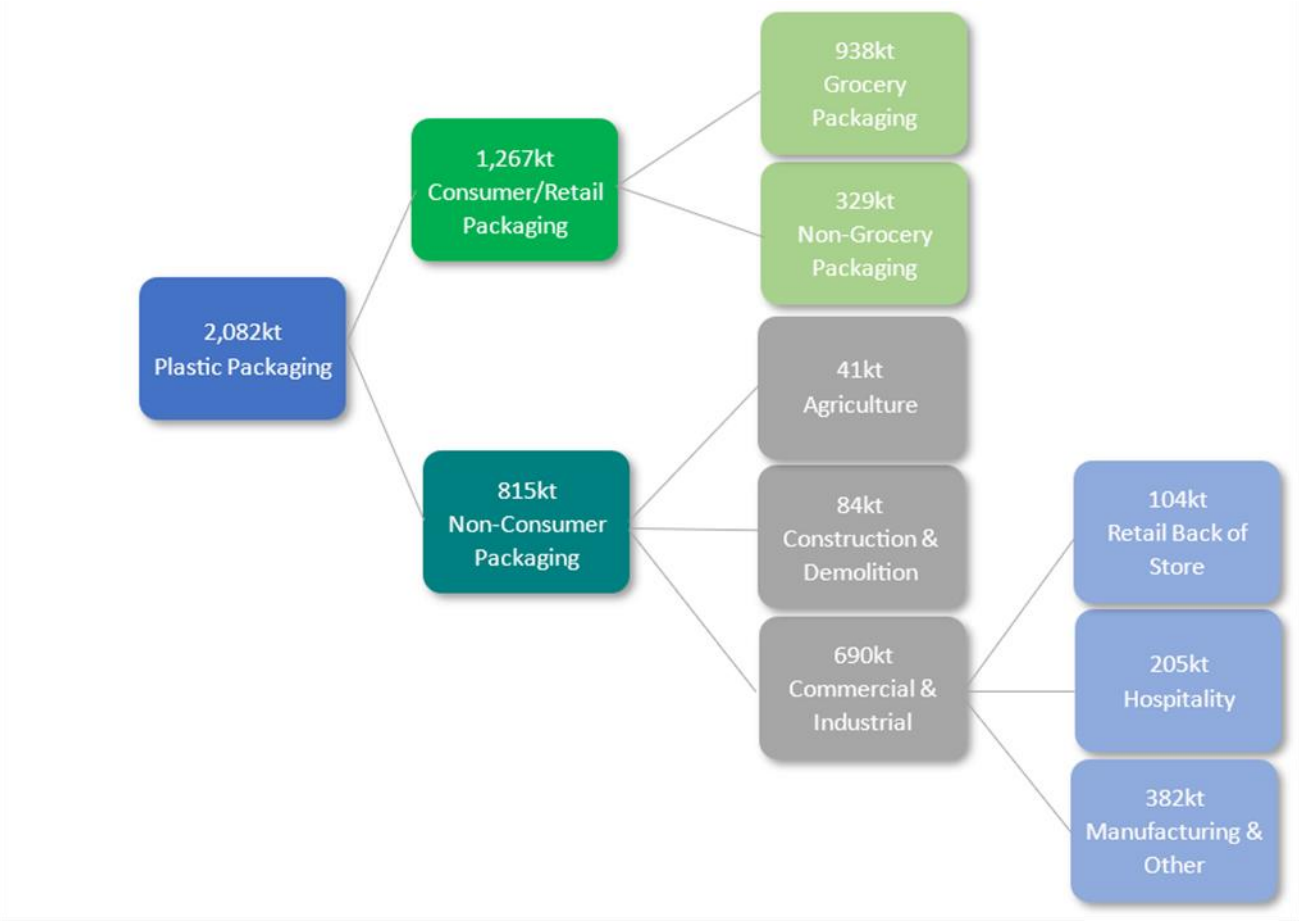
This project estimates UK plastic POM for 2022 to be 2,082kt (+/- 6%).

This estimate is derived from reported obligated data (EA, NPWD) and cross-checked as far as is possible using a bottom-up methodology combining data from various sources for each sector and data provided by the project's industry Steering Group.

This represents a potential decrease of 208kt[20] from the estimated 2019 flow figure of 2,290kt. It is likely that the decrease in plastic packaging POM has been influenced by packaging material light-weighting and a shift in consumer purchasing habits.

A further breakdown of plastic packaging POM in these sectors is shown in Figure 5[21].

Figure 5: Plastic Packaging POM by Sector, 2022



Plastic packaging POM in the consumer retail sector is estimated to be 1,267kt in 2022 (+/-6%).

Plastic packaging POM in the non-consumer sector is estimated to be 815kt in 2022 (+/-13%).
The plastic POM figure is built up using a variety of components, based on the key sectors for plastic packaging, including:

[20] *208kt is a decrease of 10%.*
[21] *Figures may not add due to rounding.*

- Plastic packaging around food/drinks/other groceries, including body care/clothing/DIY products etc., as sold by supermarkets and other non-grocery retailers, sourced from the Environment Agency and Valpak's EPIC database[22];
- Plastic packaging around food/drink as consumed in the hospitality sector, sourced from Valpak's EPIC database;
- Plastic packaging discarded by retailers back-of-store, obtained through a survey undertaken for the purposes of this study;
- Plastic packaging used by the construction industry, based on secondary research sources, such as the Green Construction Board and BRE, using the same approach as in Plastic Flow 2025;
- Plastic packaging used in the manufacturing industry, using the POM calculated in Plastic Flow 2025, which was sourced from Steering Group member data; and data collected in a survey as part of the Valpak/WRAP 2015 C&I Plastic Packaging[23] project; and
- Plastic packaging used in agricultural sector, based on a Valpak report, 'UK AWP Waste Arisings, Valpak 2007', itself based on 2006 data and government issued statistics for crop and livestock output.

The total plastic POM estimate was cross-checked and found to be 206kt higher than data reported by obligated companies under the Packaging Waste Regulations (using the UK net pack/fill calculation method). This suggests that non-obligated companies, handling fewer than 50 tonnes of packaging or with lower than £2 million turnover and free riders account for 10% of plastic packaging in the UK. This proportion has decreased from the 13% non-obligated POM identified in 2019. It is important to stress that the net pack/fill estimates are themselves subject to a degree of error because they rely on the robustness of the data submitted to NPWD. In addition, there have been a number of late registrants in 2023. Valpak therefore undertook two methods to adjust the aggregated data tables provided by the Environment Agency under FOI. The NPWD data is widely recognised as being the best available as there is a legal obligation for companies to submit data that is as accurate as reasonably possible, which is then audited by the regulating body. This data is used by policy makers and their agencies.

6.1.1. Conclusions: POM

The project's estimate of UK plastic packaging POM for 2022 is 2,082kt +/-6%, a decrease of 208kt[24] from the previous figure of 2,290kt for 2019[25].

The POM figure is the most robust estimate that can be derived using a variety of the most authoritative methods, including industry estimates, Valpak data and publicly available data.

Plastic packaging POM in the consumer sector is estimated to be 1,267kt +/-6% in 2022.

This is based on primary data alongside reliable market share data. No other method is used for deriving consumer data as this method is considered the most robust available and is accepted by industry as such.

Plastic packaging POM in the non-consumer sector is estimated to be 815kt +/-13% in 2022.

For film, this method is based on a combination of primary (survey) data and secondary research. For rigids, this is based on the findings of the WRAP/ Valpak report into rigid packaging in the C&I sector, and on secondary research.

It is likely that any increase in sales of products using plastic packaging have been offset by light-weighting and a shift towards other packaging materials between 2017 and 2022.

The plastic packaging industry has believed for some time that packaging producer activity to light-weight plastic packaging[26] has negated any potential growth in consumption and the results of this work would seem to support this assumption.

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[22] The database is based on information collected direct from suppliers as well as information sourced internally, meaning that it holds a wide coverage of information across multiple product ranges. Product specific data collection is completed through site visits, supplier mailings and weighing in-house (purchasing product and collecting used product from staff). All data goes through a comprehensive checking process on receipt and is stored in Valpak's database - Environmental Product Information Centre (EPIC).

[23] http://www.wrap.org.uk/sites/files/wrap/Rigid_Plastic_Packaging_report_0.pdf

[24] 208kt is a decrease of 10%.

[25] https://www.valpak.co.uk/knowledge-hub-post/packflow-covid-19-phase-1-plastic/

[26] Including down-gauging activity and a shift to using non-plastic packaging materials.

Plastic drinks packaging is estimated to account for 391kt of the total POM in 2022. 229kt comes under the scope of the DRS.

Valpak EPIC data and additional market data suggests that 81% of this tonnage is sold via the retail or consumer market and 19% via the non-consumer or hospitality sector, with 100kt being HDPE, 279kt PET and 11kt other polymers. These figures have been cross-checked with industry and published industry data.

6.2. Polymer/ Format Composition of Plastic POM

The estimated composition of consumer plastic packaging in the UK in 2022 is shown in Table 6. The category 'Other' includes elements of packaging such as caps & lids, toothpaste tubes, chocolate/sweet wrappers, egg boxes, blister packs and clothing hangers.

Table 6: Consumer Plastic Packaging by Format and Polymer, 2022 (kt)

	HDPE	LDPE	PE	PET	PP	PS	PVC	Other	Grand Total	
Bottle	148	1	1	338	4	0	0	0	**493**	*39%*
Film	9	79	41	31	98	0	1	78	**336**	*27%*
Other	9	4	6	23	44	13	1	9	**109**	*9%*
PTT	1	0	1	218	92	12	0	4	**329**	*26%*
Grand Total	**168**	**84**	**49**	**610**	**237**	**26**	**3**	**91**	**1267**	
	13%	*7%*	*4%*	*48%*	*19%*	*2%*	*0.2%*	*7%*		

To provide a breakdown by format and polymer of consumer plastic packaging, supermarket packaging composition (both grocery and non-grocery product types) was used as a proxy for grocery packaging, but only the non-grocery categories of supermarket packaging (around toys, electrical, clothing, etc.) were used as a proxy for non-grocery packaging. In addition to non-grocery items, a certain quantity of drinks are sold through non-grocery retailers and so allowances have been made for these non-grocery drinks sales in the non-grocery composition. This follows the same methodology as Plastic Flow 2025.

There are fewer data sources to estimate non-consumer POM than consumer POM and the levels of uncertainty around the data are greater. This is especially true of format and polymer composition data and therefore the splits in the below summary table should be regarded as indicative, with a high level of uncertainty.

Table 7: Summary of Indicative Total Non-consumer POM Composition, 2022 (kt)

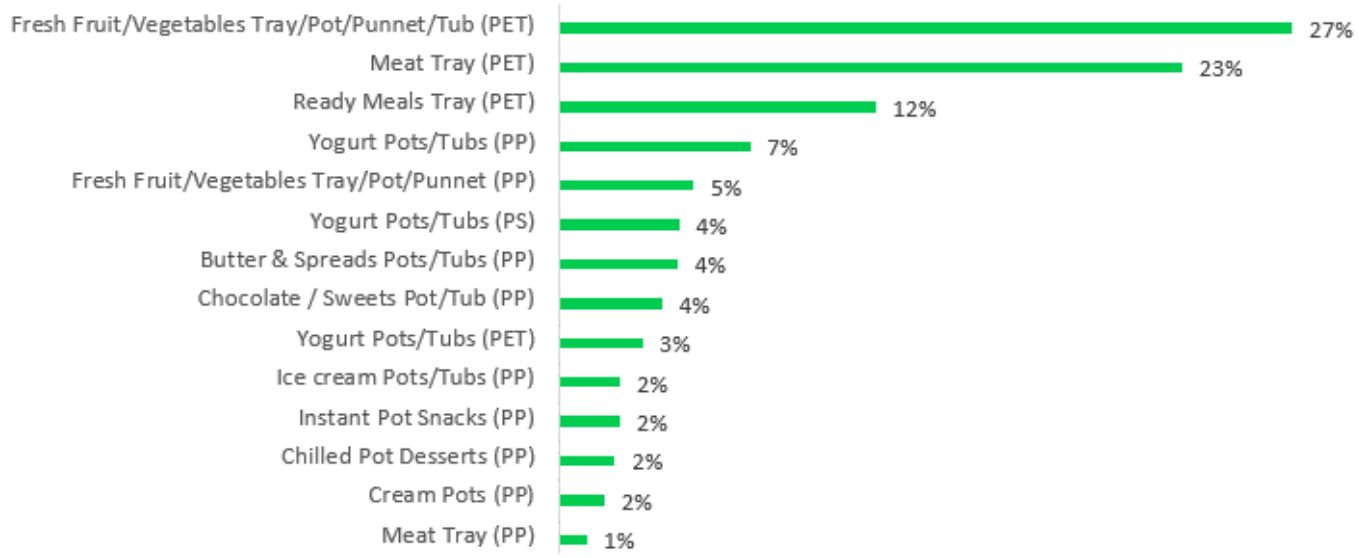
	HDPE	LDPE	PE	PET	PP	PS	PVC	Other	Grand Total	
Bottle	211	0	0	63	2	0	0	1	**277**	*34%*
Film	10	227	100	2	21	0	7	4	**371**	*46%*
Other	6	0	1	1	5	0	0	1	**14**	*2%*
PTT	17	0	1	14	98	22	0	1	**152**	*19%*
Grand Total	**243**	**228**	**103**	**79**	**126**	**22**	**7**	**7**	**815**	
	30%	*28%*	*13%*	*10%*	*15%*	*3%*	*1%*	*1%*		

Although this non-consumer POM composition is indicative, the format and polymer splits are consistent with those identified in 2017 and 2019.

Due to the quantity of packaging data available in Valpak's EPIC database, further analysis was undertaken on consumer POM as part of the PackFlow project. This included an assessment by format and polymer type of consumer pots, tubs and trays (PTTs) and of consumer drinks packaging.

The dominant polymer in consumer PTTs remains PET, with 66% of PTTs being made of PET. The second most popular polymer is PP, constituting 28% of PTTs in the UK[27]. In terms of usage, the most common category of PTTs (PET) is fresh fruit and vegetable packaging, with 27%. This is illustrated in Figure 6.

Figure 6: Key PTT Applications, 2022



Fruit and vegetable punnets and meat trays account for just over half of PP PTTs.

Since Deposit Return Schemes (DRS) are being developed in each of Scotland, England, Wales and Northern Ireland, it was considered of interest to present the plastic primary packaging data relating to the drinks market.

The total number of drinks POM is shown within Table 8.

Table 8: Plastic Drinks Packaging POM, 2022 (kt)

Drinks	Consumer	Non-consumer	**Total**
HDPE	84	17	**101**
PET	222	57	**279**
Other	11	0	**11**
Total	**317**	**74**	**391**

[27] *Polymer composition of PTTs as given in this analysis vary slightly from those provided in the overall POM composition table. This is due to the film element of PTTs (closures, lids, etc) being included as part of PTTs in this analysis, being included within the film category of the overall POM composition table. Including the film element of PTTs in this analysis allowed for comparison with previous work undertaken.*

The DRS applies to drinks that come in containers between the sizes of 50ml-3L[28]. For plastics, only PET drinks containers are included within the DRS[29] [30]. This is shown in Table 9 below.

Table 9: Plastic Drinks Packaging POM in Scope of the DRS, 2022 (kt)

Drinks	Consumer	Non-consumer	**Total**
PET	219	10	**229**

The analysis indicates that in 2022 there was 391kt of plastic drinks packaging placed onto the UK market[31]. In order to verify this data, Dairy UK data relating to the milk market was assessed, with total milk sales for the UK in litres and by each key market, such as retail and hospitality, being identified[32]. Of the 390kt POM, 229kt is within the scope of the DRS under specifications published at the time of conducting the PackFlow 2023 report.

6.3. Plastic Packaging Recycling

The PackFlow Refresh report estimates the quantity of accredited UK plastic packaging recycled to have been between 926kt and 1,285kt in 2022. A range is used to express recycling levels as the point at which recycling is measured can vary, and therefore the quantities are shown as a maximum (recovered plastic into recyclers[33]) and a minimum (recycled polymer out of recyclers[34]).

The table below shows a summary of the modelling results for waste plastic packaging delivered to recyclers, either in the UK or overseas, and the resulting recycled plastic produced by them.

Table 10: UK Domestic Plastic Packaging Recycling & Export, 2022 (kt)

Stream	Recovered Plastic into Recyclers	Recycled Polymer out of Recyclers
Consumer UK Recycling	409	270
Consumer Export	197	130
Non-consumer UK Recycling (films)	201	161
Non-consumer UK Recycling (rigids)	81	73
Non-consumer Export (films)	258	181
Non-consumer Export (rigids)	139	111
TOTAL Recycled in / Recycled out	**1285**	**926**

Key data sources used for the analysis were RECOUP's UK Household Plastics Collection Survey 2022[35] and modelling of estimated inputs and outputs to UK plastic recyclers in 2022. The was combined with NPWD export data

[28] *Within Scotland container sizes in scope of the DRS are proposed to be between 100ml-3L since an announcement made by the Minister for Green Skills on 20th April 2023. Prior to this announcement container sizes in scope of the DRS were 50ml-3L.*

[29] *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1130296/DRS_Government_response_Jan_2023.pdf*

[30] *https://www.netregs.org.uk/environmental-topics/carbon-reduction-and-efficiency/scotland-s-deposit-return-scheme/what-is-the-deposit-return-scheme-drs/#:~:text=The%20DRS%20applies%20to%20drinks,Aluminium*

[31] *Bottled drinks only, including all caps and labels.*

[32] *http://www.dairyuk.org/images/documents/publications/THE-WHITE-PAPER-2017.pdf*

[33] *Plastic packaging waste accepted for recycling (input)*

[34] *Recycled polymer produced (output)*

[35] *RECOUP's most recent survey based on 2023 data was not published at the time of writing this report and so the 2022 survey (based on 2021 data) was used.*

to firstly assess consumer waste plastic packaging exports (RECOUP's survey minus what is believed to have been recycled in the UK). The remainder of exports is assumed to be C&I waste plastic packaging, which was further split into C&I films and C&I rigids. Unaccredited recycling is when plastic packaging is recycled without a PRN/PERN being raised for it.

The total tonnage for plastic packaging delivered to recyclers in 2022 was estimated to be 1,285kt based on the bottom-up modelling. NPWD has a figure of 1,244kt, 3% lower. Whilst the difference may be related to unaccredited recycling, as the average PRN value in 2022 was £231 (Letsrecycle.com) it is felt more likely to be due to assumptions made during the modelling. Due to the high PRN value an assumption of no unaccredited recycling in 2022 was made as a recycler or exporter would not be able to compete for feedstock without being accredited and using the PRN / PERN value.

Table 11: Summary of UK Plastic Packaging Waste into and out of Recyclers as a Percentage of POM, 2022 (kt,%)

Waste Plastic Stream	POM (kt)	Recycled Plastic into Recycler (kt)	Recycled Plastic Out of Recycler (kt)	Recycled Plastic in as % of POM	Recycled Plastic out as % of POM
Consumer Total	**1267**	**606**	**400**	**48%**	**32%**
Consumer PTTs/Bottles	929	581	385	63%	41%
Consumer Film	338	25	15	7%	4%
Non-consumer Total	**815**	**679**	**525**	**83%**	**65%**
Non-consumer Rigids	429	220	184	51%	43%
Non-consumer Film	371	459	342	124%	92%
Non-consumer Other	14	0	0	0%	0%
Grand Total	**2082**	**1285**	**925**	**62%**	**44%**

It is important to note that neither recycled plastic in as a percentage of POM or recycled plastic out as a percentage of POM aligns with the official recycling rate (as measured in the UK). The latter is based on the waste plastic packaging supplied to recyclers minus any non-target material. The non-target material is based on sampling and so, in reality, does not fully account for factors such as food contamination or moisture. Looking at NPWD, we can see that the PRN / PERNs issued overall are 93% of the waste received / exported. An approximation of the UK recycling rate for plastic, as measured based on PRN / PERN issuing, could therefore be made by taking 93% of the of the modelled waste plastic inputs to recyclers and calculating this as a percentage of POM. This gives a recycling rate of 57%.

As with previous reports, the figures for non-consumer film are high. The recycled plastic into recyclers as a percentage of POM is likely to be particularly high due the percentage of non-target material in some grades of retail and supermarket film. Some of the non-target material is packaging and is recycled, however, it is generally rigid items such as PET and PP trays and strapping. As such, this will act to overstate the C&I film percentage and understate the rigid C&I percentage. The recycled plastic out figure is also higher than is likely to be the case. This could be due to a number of factors. Firstly, a high-level assumption has had to be made on the split of film and rigid C&I packaging exported due to the lack of data in this area. A second factor is that some of the film exported may not in fact be packaging. This could be a due the difficulties in separating packaging and non-packaging film but may also be due to miss-issuing of PRNs / PERNs on non-packaging material.

Of the plastic packaging not recycled for both consumer and non-consumer packaging, 997kt (80%) is sent for energy recovery and 159kt to landfill (20%) in 2022, estimated using WDF and published statistics on UK disposal routes for plastic packaging.

This is based on an estimated total of 661kt of consumer plastic packaging not being recycled and 206kt process waste generated within the recycling process (assumed to be disposed of within EfW). For non-consumer, 135kt has been estimated as not being recycled and 154kt process waste generated within the recycling process (assumed to be disposed of within EfW).

6.3.1. Conclusions: Recycling

The UK's domestic plastic packaging recycling rate in 2022 is between 44% and 62%.

If measuring recycling (by weight) on entry to a reprocessor, the UK's domestic plastic packaging recycling rate is estimated at 62% (1,285k tonnes recycled). If measured after conversion on exit from reprocessing, the rate is lower at 44% (925k tonnes recycled).

The consumer plastic packaging recycling rate for the UK in 2022 is between 32% and 48%.

If measuring recycling (by weight) on entry to reprocessing, the UK's consumer plastic packaging recycling rate is estimated at 48% (606k tonnes recycled). If measured after conversion on the exit of reprocessing, the rate would be lower at 32% (400k tonnes recycled).

The non-consumer plastic packaging recycling rate for the UK in 2022 is between 65% and 83%.

If measuring recycling on entry to reprocessing, the UK's non-consumer plastic packaging recycling rate is estimated at 83% (679k tonnes recycled). If measured after conversion on the exit of reprocessing, the rate would be lower at 65% (525k tonnes recycled).

The non-consumer film recycling rate for the UK in 2022 is unfeasibly high.

The recycling rates of non-consumer film are estimated at 93%-126%[36]. One explanation for this could be the incorrect allocation of PRN/ PERNs against either non-packaging film or non-UK packaging due to the presence of contamination and moisture in bales. Research is recommended both into non-consumer film POM and the incorrect issuing of PRNs.

Of the total 1156kt of plastic packaging not recycled and lost during the recycling process, 997kt (80%) is sent for energy recovery and 159kt to landfill (20%) in 2022.

This is based on an estimated total of 867kt of consumer plastic packaging not being recycled and 289kt of non-consumer not being recycled, estimated using WDF and published statistics on UK disposal routes for plastic packaging.

6.4. Plastic End Markets

Table 12 provides a summary of key areas of usage of UK recycled polymer. The breakdown of how recycled polymer produced in the UK is used is based on in-house knowledge, and discussions with industry experts and recyclers. For PET, the recycled polymer is produced from bottles and trays (consumer and non-consumer from the hospitality sector). For HDPE the largest volume of recycled polymer comes from bottles/ household trays, but rigid C&I packaging also forms part of this stream. For PP there is a roughly equal split between recycled polymer produced from bottles/ trays and PP from rigid C&I packaging. Recycled LDPE is nearly all derived from C&I and manufacturing films.

[36] *An unfeasibly high non-consumer film recycling rate was also reported in the Pack Flow 2019 and the Plastic Flow 2025 report. It was outside the scope of this project to follow the recommendations made within the Plastic Flow 2025 report, however this report acknowledges that further work is needed in this area to improve data accuracy.*

Table 12: Summary of End Markets for UK Recycled Plastic Packaging

PET		
Application	Examples	Indicative usage
Sheet manufacture	Thermoform trays, etc.	25%
Bottles	Food and non-food bottles	70%
Fibre	Polyester fibre for fill	5%

HDPE		
Application	Examples	Indicative usage
Packaging	Food and non-food bottles	50%
Construction	Pipes, chambers, roof spacers, plumbing items	30%
Horticultural	Compost bins, water butts, wheel bins, watering cans, etc.	10%
Household items	Garden furniture, household items such as boxes and buckets.	5%
Mixed PO application	Plastic wood and board, etc	5%

PP		
Application	Examples	Indicative usage
Automotive	Interior design items, wheel arches, ducting, battery cases, etc.	40%
Packaging	Paint pots, pallets, crates, trays, boxes	40%
Horticulture	Plant pots, seed trays	15%
Mixed PO applications	Plastic wood and board, etc	5%

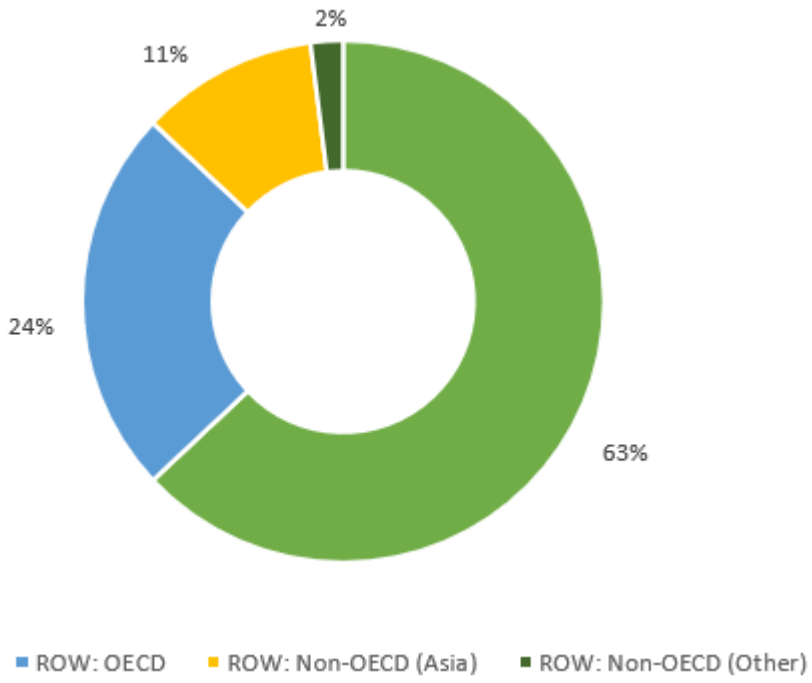
LDPE		
Application	Examples	Indicative usage
Construction films	Damp proof membranes, building films for temporary protection, gas barrier protection	40%
Plastic bags & sacks	Refuse sacks, recycling sacks, carrier bags	25%
Agricultural films	Crop cover (mulch film)	10%
Packaging	Shrink wrap, pallet hoods, etc.	15%
Mixed PO applications	Plastic wood and board, etc.	10%

Based on a conversion rate of 58% for consumer and 83% for non-consumer, 121kt of PET is estimated to be recovered from the recycling process. If 70% of this material is used in the manufacture of new bottles, that would be approximately 84kt of UK PET being utilised in the process.

As a result of the restrictions on imports of post-consumer waste plastic into China implemented at the end of 2017, a lot of the material was diverted to South East Asia and Turkey. Although some recycled pellet will be used in domestic applications, these markets often supply some back into China. It is likely that domestic end markets in Turkey would be broadly similar to those in Asian markets, for example, recycled PET used in the production of polyester fibre. Since the Plastic Flow 2025 report was published, the end markets for recycled LDPE polymer have changed. It is thought that more is used in film applications, such as construction films and plastic bags, and slightly less in agricultural film production and foamed applications.

A Freedom of Information Act request was made to the Environment Agency for information on where UK waste plastic packaging was exported to in 2022. Reproduction of this data is subject to the conditions set out in the Open Government License version 3.0. Please see conditions here: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Figure 7: Export Destinations for UK Plastic Packaging Waste by Region, 2022 (%)



6.4.1. Conclusions: Plastic Packaging End Markets

The main application for UK recycled PET is in food and non-food bottles.

Approximately 70% of UK recycled PET is used within food and non-food bottles. The majority of PET not used in this way is used within sheet manufacture to make products such as thermoform trays.

UK recycled HDPE is used comprehensively in a variety of applications, such as packaging, construction and horticultural..

Approximately 50% of UK recycled HDPE is used in the packaging sector, a further 30% in the construction sector, 10% in horticultural and 5% in household items. The remainder is used in a variety of products such railway sleepers, garden furniture and boxes.

UK recycled PP is predominantly used to make automotive products and packaging.

Approximately 40% of UK recycled PP is used in automotive products and a further 40% in packaging.

UK recycled LDPE is mainly used to make new films for construction, bags, sacks and agriculture.

Approximately 40% of UK recycled LDPE is used for construction films, 25% for plastic bags & sacks and around 10% for agricultural films. The remainder is used in other applications such as packaging and the production of plastic wood.

6.5. Scheme Administrator Submissions

The total tonnage of packaging POM that is like to be declared by obligated business to the scheme administrator as meeting the criteria of being for public/consumer use (formally referred to as 'household / household like') is 1,324kt, or 1,095kt when DRS material is excluded.

Table 13: Total Expected Scheme Administrator Submissions (kt)

Material / Situation	Total POM	Total Consumer	Total Non-Consumer	Total Hospitality	Total Hospitality - Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Plastic - All	**2,082**	1,267	815	205	57	**1,324**
Plastic - excluding DRS	**1,853**	1,048	805	195	47	**1,095**

6.6. Consumer Packaging in the Household Waste Stream

The total proportion of consumer plastic packaging from Grocery retailers that is disposed of in the household waste stream is 80%. The total proportion of consumer plastic packaging from Non-Grocery retailers that is disposed of in the household waste stream is 93%. This is based on the same sample of retailers as is used in the rest of this report and equates to 1,050kt (83%) of packaging in total across both Grocery and Non-Grocery retail (consumer packaging).

6.7. Consumer Packaging in the 'Litterable' Categories

The total proportion of consumer plastic packaging from Grocery retailers within the 'litterable' categories (as described in the material specific reports) is 26%. The total proportion of consumer plastic packaging from Non-Grocery retailers within the 'litterable' categories is 3%. This is based on the same sample of retailers as is used in the rest of this report and equates to 257kt of packaging in total.

6.8. Packaging Future Trends and Scenarios

Two EPR scenarios relevant to plastic are (with further analysis available in the material specific report);

- EPR scenario 1: All packaging materials subject to recycling obligations under 2007 Regulations for 2024 and under new EPR regulations from 2025 onwards (all packaging is in scope of current producer responsibility obligations from 2022 to 2025);
- EPR scenario 2: DRS drinks containers *excluding* glass removed from recycling obligations under EPR in 2027 onwards

1.1.1. EPR Scenario 1

Plastic POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes it is projected to be below its 2022 level until 2027. Business targets are projected to increase by 1% point per annum and reach 65% in 2028. The POM projection is reflected in the projection of obligated tonnage for plastic packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this plastic packaging is projected to be in a surplus relative to the business target 2023 to 2028.

1.1.2. EPR Scenario 2

Plastic POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes from 2024 it remains below its 2022 to 2026. Plastic drinks containers (PET Bottles) are removed from EPR from 2027 onwards (~399kt). The business targets for the remaining material are projected as constant at 2024 level of 61%. The POM projection is reflected in the projection of obligated tonnage for plastic packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this a surplus relative to the business target 2024 to 2026 is projected for plastic packaging. The reduction in the recycling obligation relative to the projection for accredited recycling results in a larger surplus relative to the business target from 2027 onwards.

7. Wood

7.1. Wood Packaging POM

This report estimates wood packaging POM in 2022 at 1,385kt (+/- 10%)[37]. This estimate represents an increase by less than 1% from the revised wood POM figure of 1,383kt (2019 revised data).

The wood POM estimate is established from a bottom-up approach (Table 14) as the weight of wood packaging produced in the UK plus the weight of net imported wood packaging into the UK (i.e. the weight of imported wood packaging less the weight of wood packaging exported).

Table 14: UK Wood Packaging POM, 2022 (kt)[38]

UK production of wood packaging	914
plus Wood packaging imported[39]	740
less Wood packaging exported	268
= Wood Packaging POM	**1,385**

A total of 914kt (66% of wood packaging POM) of new wood packaging is estimated to have been produced in the UK in 2022, of which 777kt is estimated to be new wood used in new/refurbished wooden pallets and 137kt is wood used in UK production of non-pallet wood packaging.

Total imports of wood packaging are estimated to be 740kt in 2022, of which 624kt is import of wood packaging declared by obligated producers who are registered, and 114kt is estimated to be wood packaging imported by unregistered producers.

Total exports of wood packaging are estimated to be 268kt in 2022, of which 235kt is wood packaging exports declared by obligated producers who are registered, and 34kt is estimated to be wood packaging exported by unregistered producers.

Figure 8: Wood Packaging POM by Sector, 2022, kt[40]

[37] *The error margin indicates that the two wood packaging POM figures are not substantially different.*
[38] *Figures may not sum up due to rounding.*
[39] *It is assumed that these figures exclude fastenings etc.*
[40] *Figures may not sum due to rounding.*

Consumer wood packaging POM is estimated at around 11kt in 2022 (+/- 15%).

The vast majority, 11 tonnes (+/- 15%), is estimated to be wood packaging in the consumer non-grocery sector.

Consumer grocery wood packaging is estimated to be 870 tonnes (+/- 6%).

Wood packaging POM in the non-consumer sector is 1,374kt in 2022 (+/- 11%).

The vast majority (99%) of wood packaging POM is in the non-consumer sector.

Wood packaging POM handled by obligated producers in 2022 is estimated to be 1,128kt (or 81% of total POM).

This represents a slight decrease on the estimated 83% of wood packaging POM obligated in 2019.

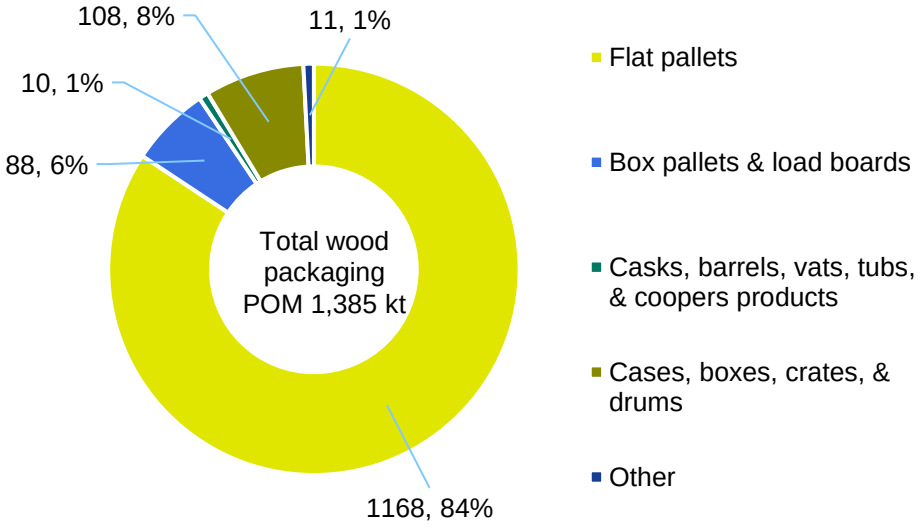
Wood packaging POM handled by unregistered producers in 2022 is estimated to be 257kt (or 19% of total POM).

This represents a slight increase on the estimated 17% of wood packaging POM that was unregistered in 2019.

By format, flat wooden pallets are estimated to account for 84% of wood packaging POM (including imports) in 2022.

Cases, boxes, crates and drums are the next largest product format for wood packaging, representing 8% of wood POM. Wooden casks, barrels, vats, tubs & coopers products represent around 1% of total wood POM.

Figure 9: UK Wood Packaging POM by format, 2022 (kt, %)



The majority (85%) of wood packaging POM in the non-consumer sector is estimated to be flat wooden pallets.

The vast majority (92%) of consumer wood packaging is in the non-grocery retail sector, with wooden trays (50%) being the predominant format category.

While the quantity of wood packaging in consumer grocery retail is small, wood packaging uses remain similar to 2019 for products such as fruits, ready meals and cheeses.

7.2. Wood packaging collection and recycling

The WRA estimates 4.5m tonnes of wood waste arising (wood packaging and non-packaging wood) in the UK in 2022.

The WRA estimates[41] that ~1m tonnes of wood waste (wood packaging and non-packaging wood) is collected each year by local authorities at HWRC/CA sites.

WasteDataFlow figures for 2021/22 indicate that local authorities collected 731kt of wood waste (wood packaging and non-packaging wood).

The vast majority (99%) of wood waste collected by local authorities is via HWRC/CA sites and is non-packaging wood. Less than 10kt of wood waste collected by local authorities is wood packaging.

Accredited waste wood packaging recycling is estimated to be 635kt in 2022.

The accredited recycling rate for wood packaging is ~46% in 2022 when comparing against the wood packaging POM of 1,385kt.

In 2022, panel board manufacturers recycled of 334kt of waste wood packaging, of which 318kt is accredited. Wood recyclers manufacturing animal bedding, equine surfaces etc. used 290kt of wood packaging in 2022.

The WRA believes that 275kt or approximately 95% of this tonnage was recorded as accredited recycling.

The total quantity of wood packaging recycled in the UK is estimated to be 666kt, and the unaccredited wood packaging recycled is estimated at 31kt.

However, there are some uncertainties around these figures due to the total accredited wood packaging recycling obtained through end-market figures not being consistent with the accredited wood packaging recycling by NPWD, such that the accredited wood packaging recycling obtained through end-market does not account for 40kt of wood compared to the NPWD figure.

7.3. Wood packaging End Markets

A total of ~4.3 million tonnes of waste wood was recovered/recycled in 2022.

Waste wood recovery by UK energy facilities (large and small scale biomass) was ~2.8 million tonnes. Around 1.4 million tonnes of waste wood was recycled into panel board, animal bedding and equine surfacing.

The quantity of wood packaging waste recovered or recycled is estimated to be 844kt in 2022.

In 2022, the panel board manufacturers recycled 334kt of waste wood packaging.

Wood recyclers manufacturing animal bedding, equine surfaces etc. used 290kt of wood packaging in 2022, and the WRA believes that 275kt or approximately 95% of this tonnage was recorded as accredited recycling.

A full market estimate of the quantity of wood packaging being re-used is unknown.

The steering group commented that the fate of substantial quantities of wooden pallets is unknown (these are wooden pallets that are not of the size typically used by the various pallet pools, but are pallets that could be re-used).

In terms of recovery of wood packaging, 136kt of wood packaging waste is estimated to have gone to large scale biomass (Biomass - Chapter IV) in 2022, with small scale biomass using 81kt of wood packaging waste.

There is limited information to determine the amount of wood packaging that ends up being disposed of via landfill or used for EfW and its split by sector (consumer/ non-consumer).

It is estimated that at most 9.1 kt of consumer wood packaging waste ends up used for EfW, and at most 2.3kt of consumer wood packaging waste ends up in landfill. There is not enough information to quantify non-consumer wood packaging sent for disposal, and there is no available information on the breakdown of the end-of-life processing (landfill/ EfW) of non-consumer wood packaging for disposal.

7.4. Packaging Future Trends and Scenarios

Wood POM tonnage is projected to reduce in 2023 compared to 2022, and decline further in 2024. While growth resumes from 2026 it remains below its 2022 level in 2028. Business targets are projected as constant at 2024 level of 42%. The POM projection is reflected in the projection of obligated tonnage for wood packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this a surplus relative to the business target 2024 to 2028 is projected for wood packaging.

[41] *Based on the WRA estimate that ~23% of annual wood waste is collected via HWRC/CA sites*

Wood packaging is not an in-scope DRS material and its projection is not impacted by the removal of DRS drinks containers from recycling obligations under EPR.

8. Summary Trends in Packaging POM by Material

8.1. Introduction

This section of the report uses NPWD time-series data on packaging handled by obligated producers, by type of packaging material, from 1998 to 2021 – this dataset represents the maximum number of annual observations available.

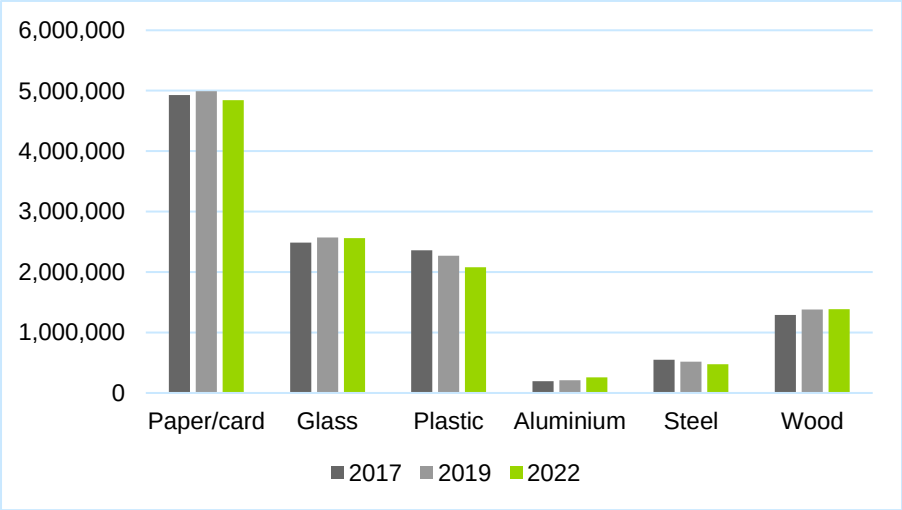
PackFlow's most recent quantifications of packaging POM are for 2017, 2019 and in the current project 2022 (Figure 2). The main takeaways from Figure 2 for packaging materials POM in 2022 compared to earlier years are;

- Paper and card has reduced compared to 2019 and 2017;
- Glass is down from 2019;
- Plastic is down from 2019 and 2017;
- Aluminium has increased compared to 2019 and 2017;
- Steel has reduced compared to 2019 and 2017; and
- Wood is stable between 2019 and 2022 but higher compared to 2017.

8.2. POM Trends

While these POM estimates are regarded by industry and Government as being the best available, they are not repeated on an annual basis, so there isn't a sufficiently long run of annual time-series observations available for a robust analysis of trends.

Figure 10: Packaging POM by material, 2017, 2019 and 2022 (kt)



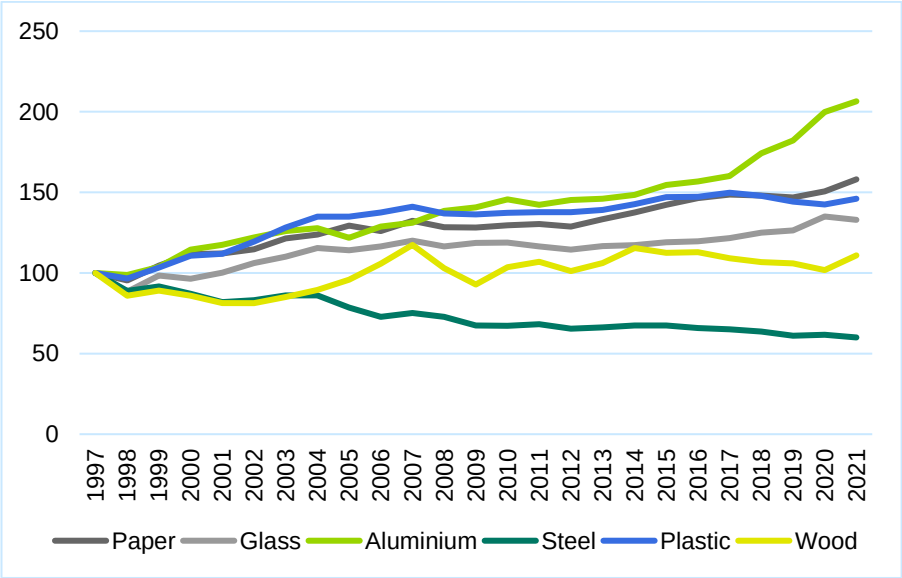
8.3. Data Submission Trends

To inform trends by packaging material type the NPWD dataset is used to calculate the measure 'net pack fill' which is regarded as the best approximation or proxy to trends in POM by type of material.

Figure 11 shows the estimates of trend in packaging materials POM (by weight) by material type from 1997 to 2021. In general, POM[42] for all materials (apart from steel packaging) has increased though clearly there are year-to-year fluctuations. Aluminium packaging has grown the fastest, followed by paper, plastic, and glass. Wood packaging has seen modest growth overall, and steel packaging has experienced year-on-year declines in most years over this period.

Since 2017 growth in aluminium and glass packaging POM has picked up relative to trend and plastic packaging POM has reduced. Since 2019, paper packaging POM has increased relative to plastic packaging POM.

Figure 11: Packaging POM trends by material, 1997 - 2021 (indexed 1997=100)



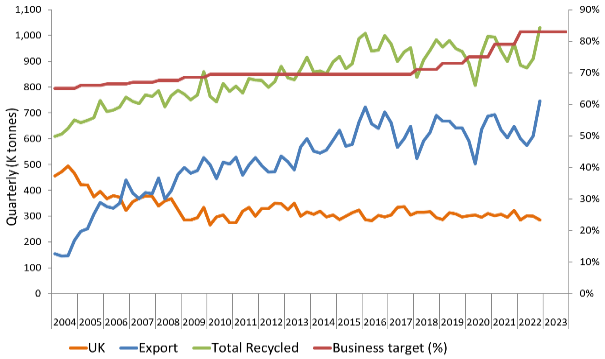
[42] Strictly speaking this is obligated POM as represented by the net pack fill measure. The % of total POM as measured by the PackFlow reports varies by material and over time.

9. Summary Trends in Packaging Recycling by Material

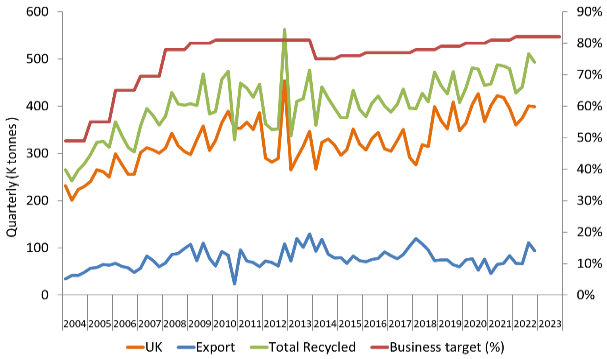
A key objective of this report is to provide an understanding of the trends in the recycling of packaging materials. To inform the recycling projections in the baseline scenario NPWD accredited recycling data (i.e.PRN/PERN) is used as a proxy for the assessment of recycling trends. Note that non-accredited recycling and export (i.e. tonnages not recorded by PRN/PERN) also takes place which has an impact on overall recycling performance. Figure 12 illustrates quarterly data on total accredited recycling, UK domestic accredited recycling and accredited exports by packaging material from 2004 to 2023. A key driver of packaging recycling is the material specific business targets, which for each material are shown on the left-hand-scale of the charts.

Figure 12: Trends in accredited packaging recycling 2004 – 2023 (k tonnes)

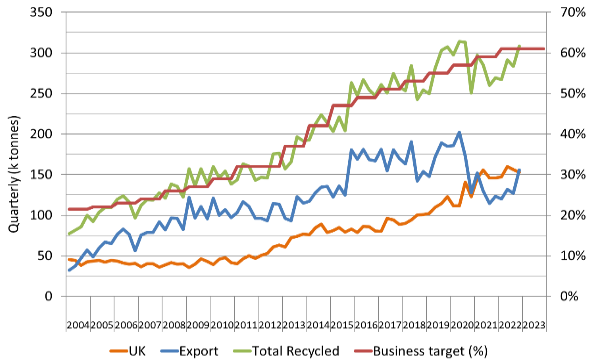
(a) Paper and card



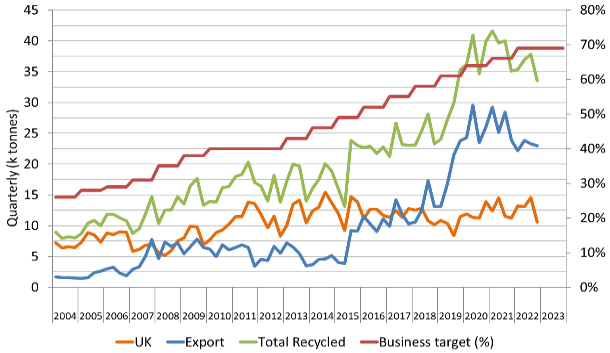
(b) Glass



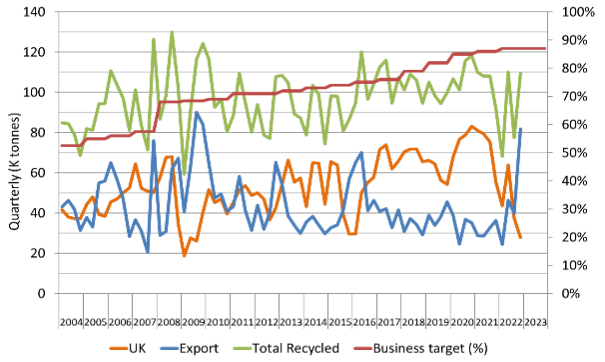
(c) Plastic



(d) Aluminium



(e) Steel



(f) Wood

A summary of the trends in packaging recycling by packaging type of packaging material is as follows:

9.1. Paper and card

UK domestic recycling declined 2004 – 2010 with modest increases in the targets being met by export. While there have been fluctuations since 2010 there's no indication of a trend. All the growth in paper and card packaging recycling has been in export of paper and card waste over the period 2004 – 2017. But that overall upward trend appears to have stabilised (despite increases in the targets) with export tonnages fluctuating since 2017 in a range between 500 – 700k tonnes per quarter, and total paper and card recycling in a range of 850 – 1,000k tonnes per quarter. Paper and card packaging recycling targets have flat-lined.

9.2. Glass

Main driver of total glass packaging recycling is UK domestic recycling. UK domestic recycling trended upwards to around 2011 as the targets increased and was then broadly stable 2012 – 2018 (the glass target was reduced in 2014 following earlier fraudulent activity). Since then, the level of glass packaging recycling has risen steadily to meet the modest year-to-year increases in the targets. During the past five years, total glass packaging recycling has fluctuated in a range around 350 – 500k tonnes per quarter. The amounts of glass packaging waste exported are small in comparison to UK domestic recycling of glass packaging waste (around 17% of total recycling, on average), and there is no indication of a trend. Glass packaging recycling targets have flat-lined.

9.3. Plastic

The strong upward trend in the total amount of plastic packaging waste recycled over the period 2004 – 2022 was driven by increases in the recycling targets. Export of plastic packaging wastes has played a key role in meeting the targets over much of this period. UK domestic plastic packaging recycling was static at around 50k tonnes per quarter to 2011 but since then it has increased steadily, exceeding the amount of plastic waste exported for the first time in 2021. Plastic recycling targets have flat-lined.

9.4. Aluminium

Slight upward trend in UK domestic recycling over the whole sample period. But UK domestic recycling does not appear to be trended since around 2012. During the period 2004 – 2015 recycling target increases were met by increases in UK domestic recycling of aluminium packaging, exports contributed but were broadly flat. Since 2015 the situation has reversed. UK domestic recycling has been broadly static (no indication of a trend) while export of waste aluminium packaging has grown rapidly, exceeding UK recycling in 2018, and in 2022, 64% of aluminium packaging waste was exported, mostly to Europe (Germany, Netherlands). Aluminium packaging recycling targets have flat-lined.

9.5. Steel

Substantial volatility over the period 2004 – 2022 in the amounts of steel packaging waste recycled either in the UK or exported but with no strong indication of any trends. Steel packaging recycling targets have flat-lined.

9.6. Wood

Upward trend seen in total recycling between 2004 and 2008, which peaked at an annual tonnage of 940k tonnes; followed by a decline that continued to a low point in 2015. Since 2015, accredited wood packaging recycling has continued to increase despite a drop in 2020. Business targets saw a slow increase between 2004 and 2009, before stagnating until 2017. In 2018, targets saw a dramatic increase to 48% in 2020, before dropping to 35% in 2021 and stagnating.

Appendix 1: Technical Appendix

This short technical appendix details the methodology underlying the projections for packaging materials POM discussed in Section 12 of the report, and recycling discussed in Section 10 of the report.

POM Projections

In this methodology, the POM projections by material type are linked to selected indicators, and to projections of these indicators. The indicators considered, through analysis of historical relationships with packaging materials POM, are (statistically) *a priori* deemed potentially useful in describing the evolution of POM quantities for each of the packaging materials. The list of potential indicators, as shown in the Table 15, are grouped according to level/growth in; economic activity (GDP, GVA by sector, construction, imports), spending (consumer spending and retail sales), and population. Time series data for all indicators is sourced from the ONS and is adjusted by the ONS to remove the effects of changes in prices, so they are indicators of activity potentially related to the tonnage of packaging POM in real-terms.

Table 15: A Selection of Indicators

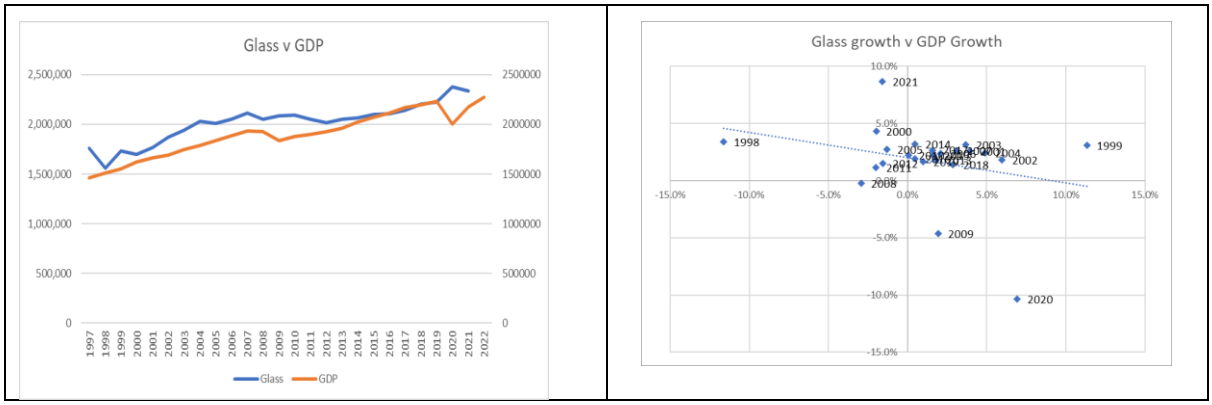
Indicator Group	Indicator and Data Source
Consumer spending	Household final consumption expenditure: National concept CVM SA - £m
Consumer spending	Total goods: Total CVM NA Year SA £m
Gross Domestic Product	GDP
Retail sales	Retail in non-specialised stores IV2X
Retail sales	Retail in predominantly food stores IV3G
Retail sales	Retail in non-food stores IV3I
Retail sales	Retail in other stores IW6U
Retail sales	Retail in textile, clothing and footwear stores IW6X
Retail sales	Retail in household goods stores IW6Y
Retail sales	Non-store retailing J58P
Retail sales	All retail excl. automotive
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles
GVA	G47: Retail trade, except of motor vehicles and motorcycles
GVA	G56: Food and beverage service activities
GVA	A: Agriculture
GVA	B: Mining and quarrying
GVA	C: Manufacturing
GVA	D: Electricity, gas, steam and air conditioning supply
GVA	F: Construction
GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles
GVA	Total GVA
Construction	Public new housing
Construction	Private new housing
Construction	Total new housing
Imports	CPA 08:WW:IM:CVM:BOP:SA: C. Manufactured products

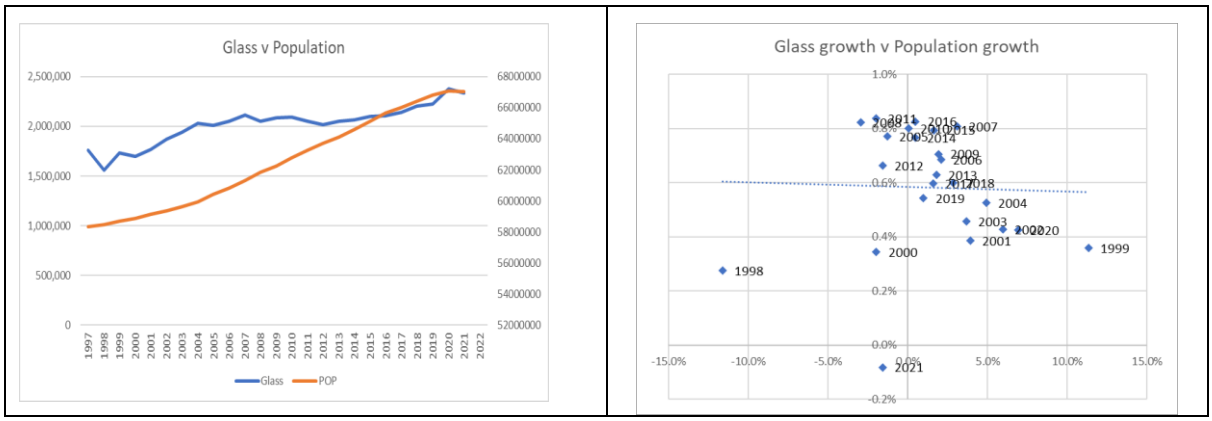
Imports	CPA 08:WW:IM:CVM:BOP:SA: 10. Food products
Population	POP

A chart-based correlation analysis for a selection of these indicators (GDP, population, and retail sales) versus POM for each packaging material type is shown below. The figures illustrate from 1997/98 to 2022 the (univariate) relationship, separately for both the levels and growth (annual % change), between the net pack fill measure - which serves as the best approximation to POM by type of material - and GDP, population and retail sales.

Figure 13: Paper and Card Packaging

Figure 14: Glass Packaging





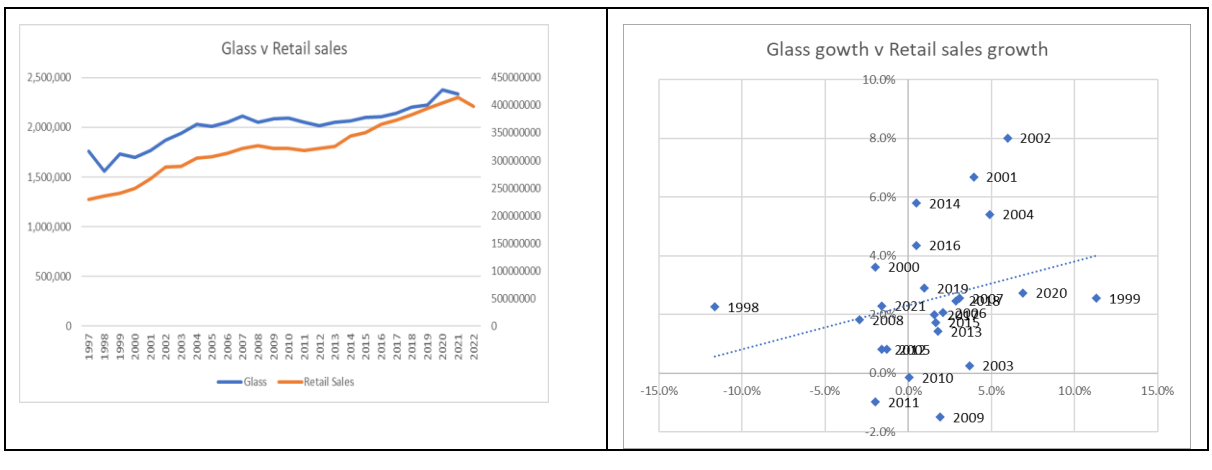
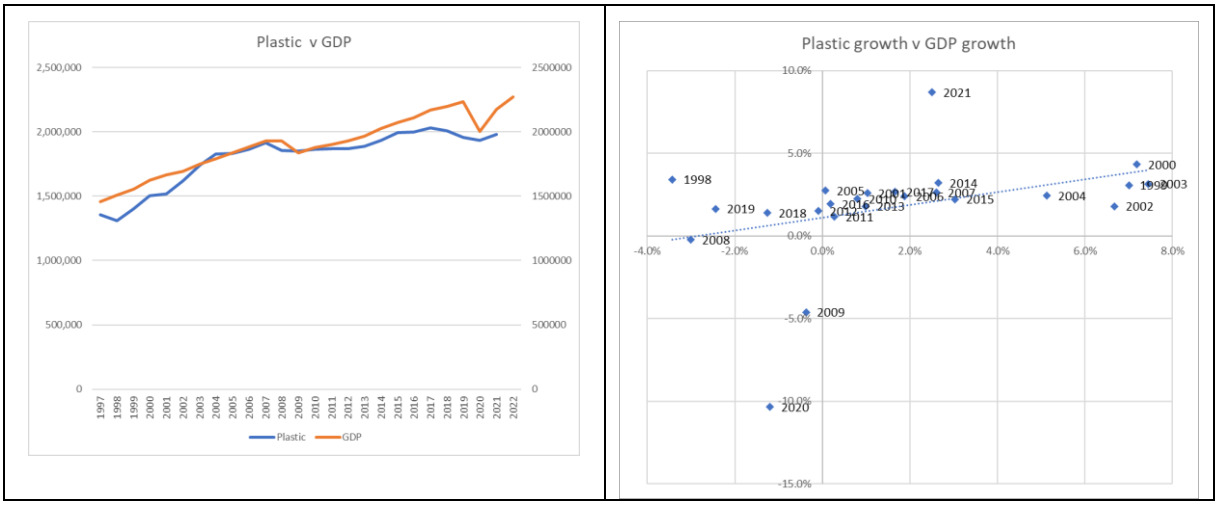
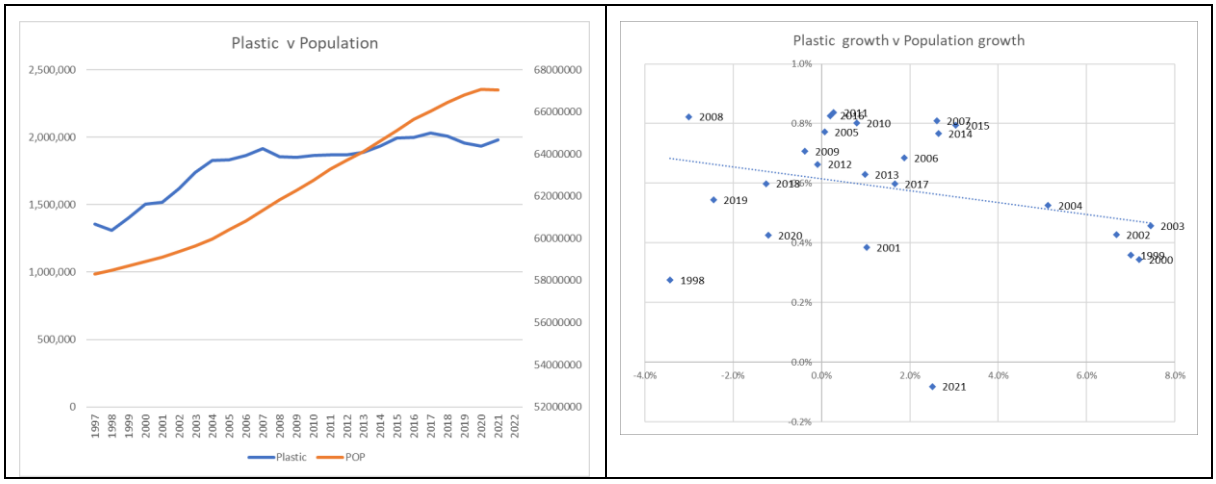


Figure 15: Plastic Packaging





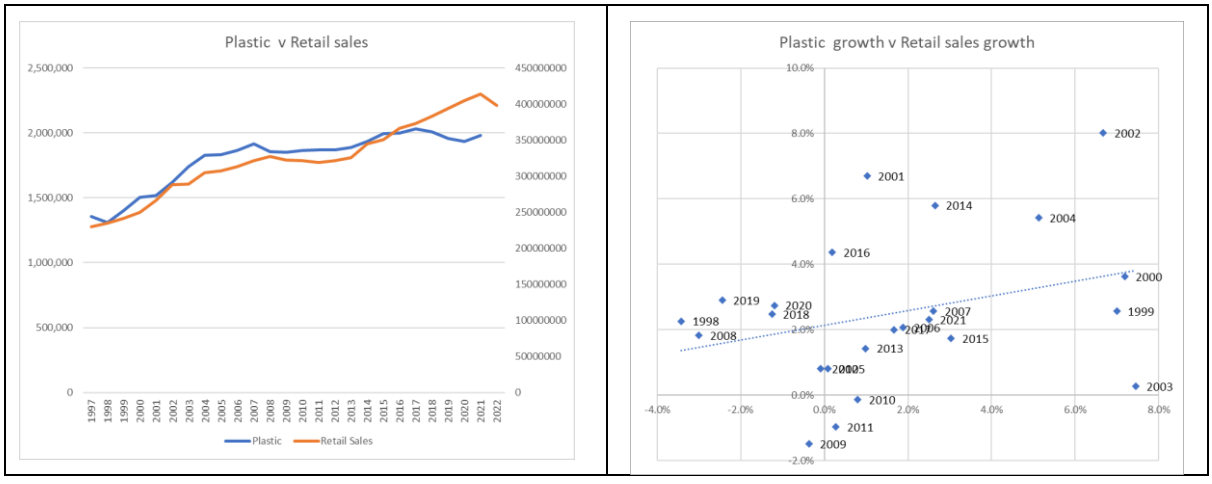
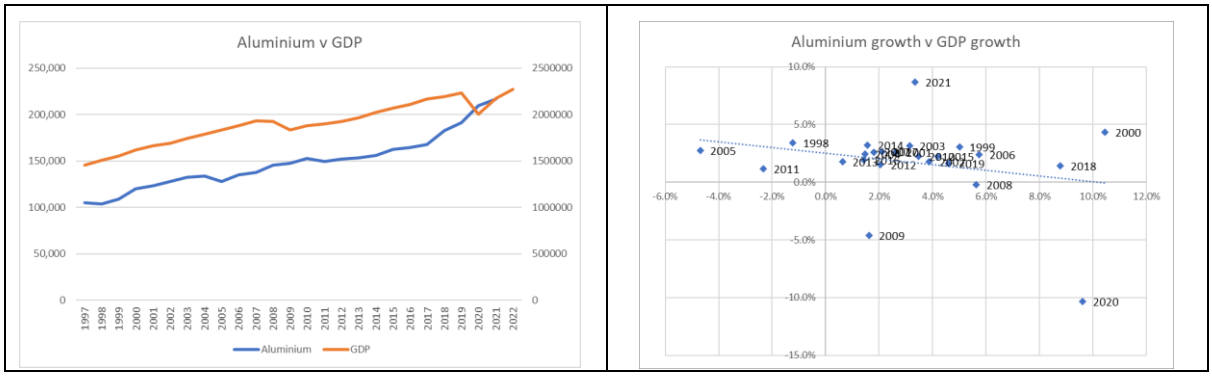
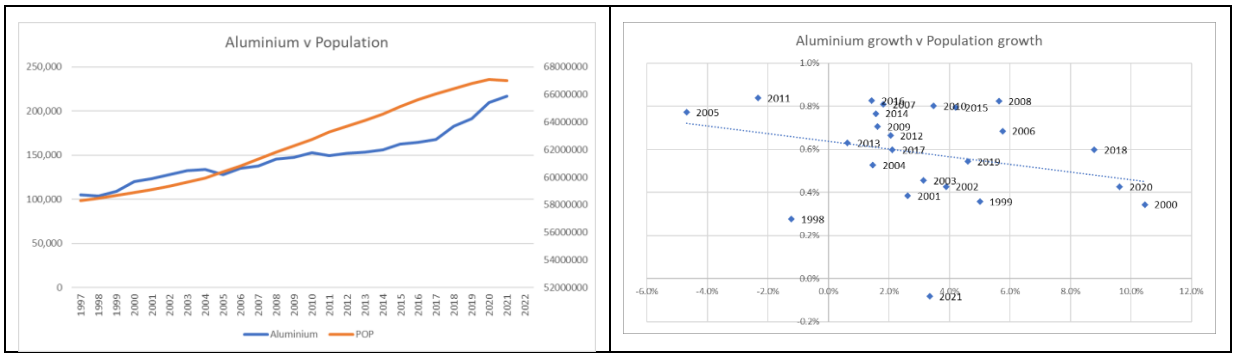


Figure 16: Aluminium Packaging





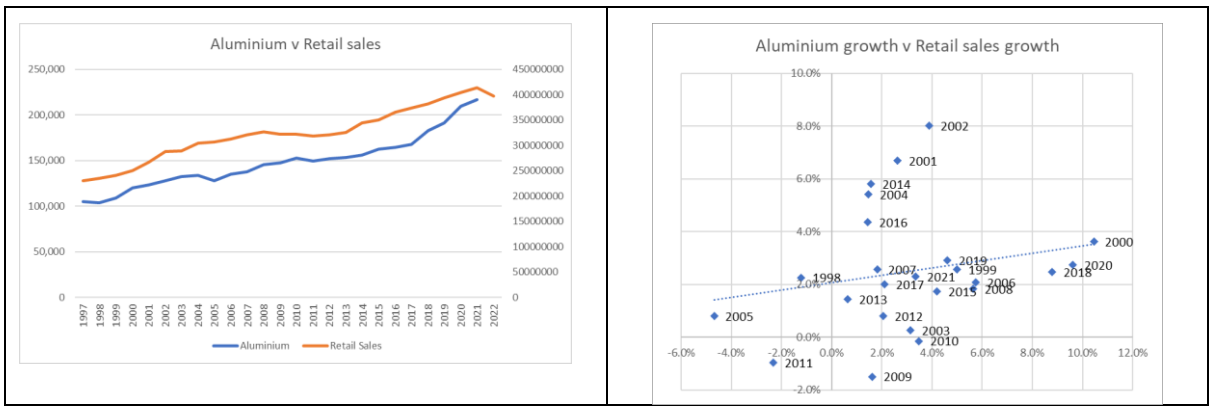
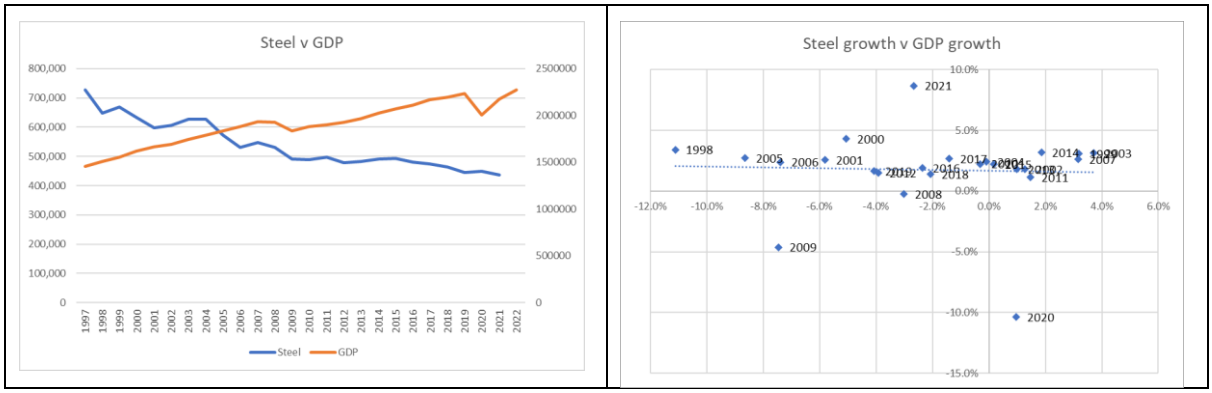
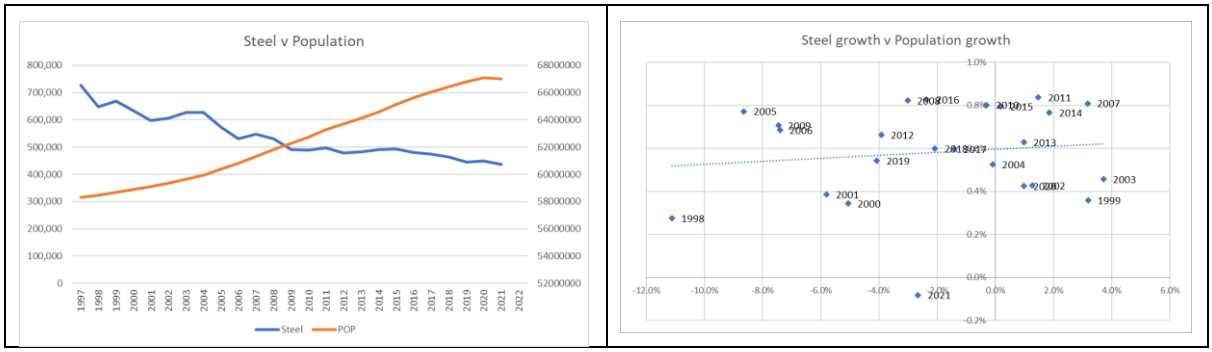


Figure 17: Steel Packaging





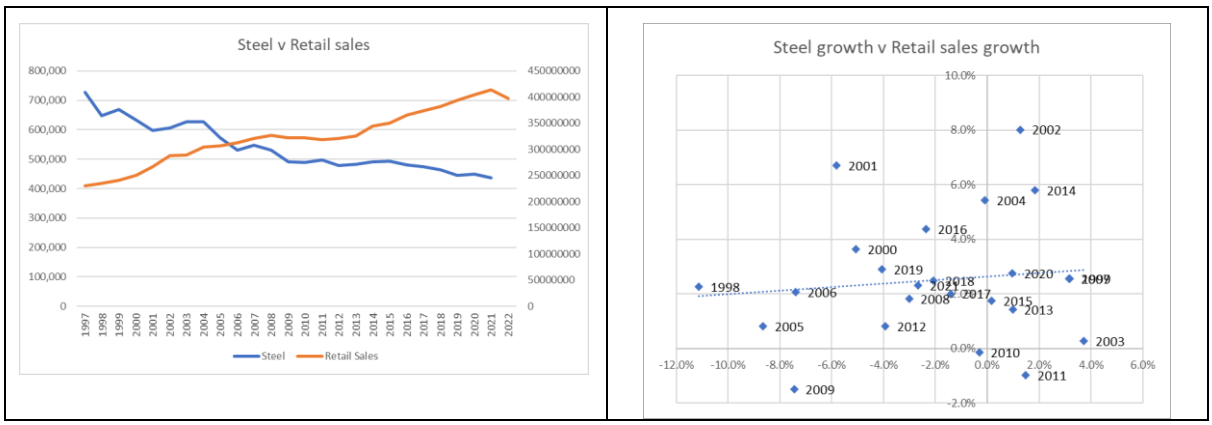


Figure 18: Wood Packaging

These charts only provide a visual assessment of the degree of association between POM and a selection of indicators. Therefore, the tables below summarise the results of a more detailed statistical (univariate) correlation analysis across a broader range of possible indicators including alternative measures of consumer spending, detailed market segments for retail sales, GVA measures by industry sector, and imports for goods.

The correlations between the trends in each of the activity measures and trends in packaging materials are shown and the strength of the correlation is denoted by the statistical significance of the t-statistic derived (Prob. t). in each case the top three correlations are highlighted.

Table 16: Correlation Analysis for Packaging Materials and Indicator Measures, Levels 1997 – 2021

Level		PAPER	Prob.t	GLASS	Prob. t	PLASTIC	Prob. t	ALUMINIUM	Prob. t	STEEL	Prob. t	WOOD	Prob. t
Consumer spending	Household final consumption Expenditure CVM SA - £m	95%	0.0%	86.2%	0.00%	93.9%	0.00%	84.7%	0.00%	-90.0%	0.00%	72.8%	0.00%
Consumer spending	Total goods : Total CVM NA Year SA £m	92%	0.0%	82.3%	0.00%	81.3%	0.00%	92.4%	0.00%	-90.8%	0.00%	69.7%	0.01%
Gross Domestic Product	GDP	97%	0.0%	88.3%	0.00%	93.7%	0.00%	88.0%	0.00%	-91.5%	0.00%	75.0%	0.00%
Retail sales	Retail in non-specialised stores IV2X	95%	0.0%	85.3%	0.00%	87.9%	0.00%	90.0%	0.00%	-88.5%	0.00%	71.9%	0.01%
Retail sales	Retail in predominantly food stores IV3G	91%	0.0%	95.3%	0.00%	92.7%	0.00%	85.3%	0.00%	-86.4%	0.00%	58.0%	0.24%
Retail sales	Retail in non-food stores IV3I	97%	0.0%	91.0%	0.00%	95.7%	0.00%	88.0%	0.00%	-92.2%	0.00%	74.7%	0.00%
Retail sales	Retail in other stores IW6U	97%	0.0%	92.2%	0.00%	90.7%	0.00%	92.9%	0.00%	-89.6%	0.00%	71.7%	0.01%
Retail sales	Retail in textile, clothing and footwear stores IW6X	85%	0.0%	76.3%	0.00%	87.6%	0.00%	74.7%	0.00%	-89.9%	0.00%	79.8%	0.00%
Retail sales	Retail in household goods stores IW6Y	54%	0.498%	61.7%	0.10%	64.6%	0.05%	40.8%	0.74%	-41.2%	4.07%	20.6%	32.39%
Retail sales	Non-store retailing J58P	80%	0.0%	75.1%	0.00%	56.1%	0.35%	92.8%	0.02%	-69.0%	0.01%	47.6%	1.61%
Retail sales	All retail excl. automotive	98%	0.0%	95.0%	0.00%	90.3%	0.00%	96.5%	0.00%	-91.2%	0.00%	67.9%	0.02%
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles	87%	0.0%	80.1%	0.00%	87.3%	0.00%	78.2%	0.00%	-89.4%	0.00%	87.1%	0.00%
GVA	G47: Retail trade, Except of motor vehicles and motorcycles	68%	0.018%	52.4%	0.71%	64.2%	0.05%	53.5%	0.00%	-50.5%	1.01%	52.3%	0.72%
GVA	G56: Food and beverage service activities	-14%	50.637%	-22.8%	27.20%	6.1%	77.08%	-38.0%	64.83%	14.8%	48.05%	0.8%	97.05%
GVA	A: Agriculture	55%	0.439%	49.7%	1.15%	64.8%	0.05%	41.7%	0.17%	-55.5%	0.40%	31.2%	12.92%
GVA	B: Mining and quarrying	-90%	0.0%	-85.7%	0.00%	-92.1%	0.00%	-83.5%	0.00%	96.1%	0.00%	-77.8%	0.00%
GVA	C: Manufacturing	95%	0.0%	92.6%	0.00%	92.3%	0.00%	87.7%	0.00%	-86.6%	0.00%	67.9%	0.02%
GVA	D: Electricity, gas, steam and air conditioning supply	-30%	14.13%	-27.4%	18.49%	-27.8%	17.90%	-31.4%	17.56%	43.2%	3.10%	-60.0%	0.15%
GVA	F: Construction	-14%	50.41%	-31.3%	12.76%	-22.8%	27.40%	-21.1%	77.77%	36.4%	7.41%	-19.9%	33.96%
GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles	85%	0.0%	71.5%	0.01%	84.8%	0.00%	70.2%	0.00%	-78.6%	0.00%	81.2%	0.00%
GVA	Total GVA	97%	0.000%	88.4%	0.00%	93.4%	0.00%	88.7%	0.00%	-92.0%	0.00%	75.2%	0.00%
Construction	Public new housing	83%	0.000%	75.5%	0.00%	82.8%	0.00%	76.1%	0.00%	-85.9%	0.00%	79.5%	0.00%
Construction	Private new housing	81%	0.000%	73.2%	0.00%	70.4%	0.01%	75.0%	0.00%	-59.0%	0.19%	60.0%	0.15%
Construction	Total new housing	87%	0.000%	78.2%	0.00%	77.2%	0.00%	80.0%	0.00%	-68.0%	0.02%	67.5%	0.02%
Imports	CPA 08:WW:IM: CVM:BOP:SA: C. Manufactured products	96%	0.000%	86.9%	0.00%	92.5%	0.00%	87.6%	0.00%	-92.8%	0.00%	77.2%	0.00%
Imports	CPA 08:WW:IM: CVM:BOP:SA: 10. Food products	97%	0.000%	91.4%	0.00%	94.2%	0.00%	89.8%	0.00%	-93.9%	0.00%	78.8%	0.00%
Population	POP	94%	0.000%	86.7%	0.00%	84.0%	0.00%	94.3%	0.00%	-92.3%	0.00%	73.1%	0.00%